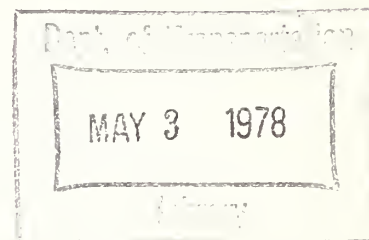


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DOT HS-803 254

# **THE AUTOMOBILE CONSUMER INFORMATION STUDY TITLE II, PUBLIC LAW 92-513**

**Contract No. DOT-HS-4-00904**  
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**BOOZ, ALLEN & HAMILTON, INC.**  
**Booz, Allen Applied Research Division**  
**4330 East West Highway**  
**Bethesda, Maryland 20014**



JUNE 1976

## **FINAL PHASE I REPORT**

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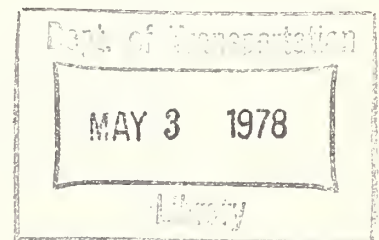
**Prepared for**  
**U.S. DEPARTMENT OF TRANSPORTATION**  
**National Highway Traffic Safety Administration**  
**Washington, D.C. 20590**

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# METRIC CONVERSION FACTORS

## Approximate Conversions to Metric Measures

Symbol When You Know Multiply by To Find Symbol

### LENGTH

in inches 2.5 cm  
ft feet 30 cm  
yd yards 0.9 m  
mi miles 1.6 km

### AREA

m<sup>2</sup> square inches 6.5 cm<sup>2</sup>  
ft<sup>2</sup> square feet 0.09 m<sup>2</sup>  
yd<sup>2</sup> square yards 0.8 m<sup>2</sup>  
mi<sup>2</sup> square miles 2.6 km<sup>2</sup>  
acres 0.4 hectares

### MASS (weight)

oz ounces 28 g  
lb pounds 0.45 kg  
short tons (2000 lb) 0.9 tonnes

### VOLUME

tsp teaspoons 5 ml  
Tbsp tablespoons 15 ml  
fl oz fluid ounces 30 ml  
c cups 0.24 l  
pt pints 0.47 l  
qt quarts 0.95 l  
gal gallons 3.8 l  
ft<sup>3</sup> cubic feet 0.03 m<sup>3</sup>  
yd<sup>3</sup> cubic yards 0.76 m<sup>3</sup>

### TEMPERATURE (exact)

°F Fahrenheit temperature 5/9 (after subtracting 32) Celsius temperature °C

## Approximate Conversions from Metric Measures

Symbol When You Know Multiply by To Find Symbol

### LENGTH

mm millimeters 0.04 in  
cm centimeters 0.4 in  
m meters 3.3 ft  
m meters 1.1 yd  
km kilometers 0.6 miles

### AREA

cm<sup>2</sup> square centimeters 0.16 square inches  
m<sup>2</sup> square meters 1.2 square yards  
km<sup>2</sup> square kilometers 0.4 square miles  
ha hectares (10,000 m<sup>2</sup>) 2.5 acres

### MASS (weight)

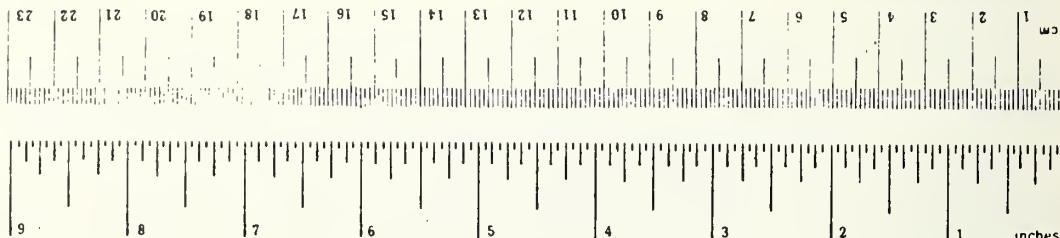
g grams 0.035 ounces  
kg kilograms 2.2 pounds  
tonnes (1000 kg) 1.1 short tons

### VOLUME

ml milliliters 0.03 fluid ounces  
l liters 2.1 pints  
l liters 1.06 quarts  
l liters 0.26 gallons  
m<sup>3</sup> cubic meters 35 cubic feet  
m<sup>3</sup> cubic meters 1.3 cubic yards

### TEMPERATURE (exact)

°C Celsius temperature 9/5 (then add 32) Fahrenheit temperature °F



\* 1 in = 2.54 exactly. For other exact conversions and more detailed tables, see *Gas, Heat, Light, 1980, Units of Weights and Measures, Part 52, 25-33* (Metric No. C-110-286).



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## I. EXECUTIVE SUMMARY

This report summarizes the results of the first phase of the Department of Transportation, National Highway Traffic Safety Administration's (NHTSA) research program to develop consumer information on automobile crashworthiness, damage susceptibility, ease of maintenance and repair, and insurance costs by vehicle make and model. The report focuses on the research activities conducted during calendar year 1974 and the first half of calendar year 1975 (Phase I), and presents a description of accomplishments during that period. Phase II of this research effort is now underway and will continue until December of 1975.

This chapter is an executive summary which summarizes the major aspects of this Phase I research effort. The report which follows describes the research approaches, findings, and conclusions of Phase I in more detail.

### 1. BACKGROUND AND STUDY PLAN

During the late 1960's, the Antitrust and Monopoly Subcommittee of the Senate Judiciary Committee held extensive hearings on the Automotive Repair Industry. In a report published in 1970, the Committee concluded that the American consumer was being subjected to unreasonable expenditures for routine automotive maintenance and repairs, and for collision damage repairs. It was estimated that as much as one-third of the annual cost for automobile maintenance and repair or \$8 to \$10 billion was the magnitude of this unreasonable consumer burden. Not only were these costs considered to be highly significant but equally alarming was the distinct recent trend which showed these costs to be increasing at a steadily increasing rate. One result of this investigation and additional hearings held by the House and Senate Commerce Committees in 1971 and 1972 was the passage of the Motor Vehicle Information and Cost Savings Act (Public Law 92-513) on October 20, 1972.



The Act addressed the problem of high repair costs through the first three of its four Titles. The fourth Title provided consumers with Federal protection from odometer tampering.

- . Title I— This Title requires the Secretary of Transportation to issue an "Economic Loss Reduction Standard" for automobile bumpers. The Title also requires an annual report to the President and the Congress on the cost savings to the public from administration of Title I of the Act.
- . Title II— This Title requires the Secretary of Transportation to perform research leading to the publication of consumer information on automobile damage susceptibility, crashworthiness, and ease of diagnosis and repair by make and model. It also requires that insurance cost comparison information be prepared for distribution through automobile dealerships. (Subsequent discussions in this report will deal only with Title II of the Act and the research program that is currently underway.)
- . Title III— This Title requires the Secretary of Transportation to provide financial and technical assistance to selected states for diagnostic and inspection demonstration projects.
- . Title IV— This Title prohibits tampering with odometers on motor vehicles and requires the seller to provide a mileage disclosure statement to the buyer upon title transfer. This Title also requires certain specific research on tamper-proofing of odometers.

In response to Title II, the NHTSA established a task force to develop a research program plan and to identify specific issues and make appropriate recommendations to management for the conduct of the Automobile Consumer Information Study mandated by Title II. The task force, after extensive deliberations, developed a two-phase feasibility study to produce a system for rating cars and to communicate that information to the public. The plan is currently underway and consists of the following four studies:

- . A study to develop the vehicle rating criteria and methods of determining the damageability, crashworthiness and repairability of automobiles

- . A crash test program
- . A study to better understand the automobile purchase decision process of consumers, identify the most appropriate methods for presenting vehicle rating information to consumers, and integrate Title II activities
- . A study to predict the nature and extent of the potentially beneficial and adverse consequences of Title II implementation for various groups and enterprises, and society as a whole.

The next four sections of this chapter describe these four major areas of research conducted during Phase I. The last section describes activities planned for Phase II.

## 2. VEHICLE RATINGS DEVELOPMENT

The primary objective of this effort was to assess the feasibility of developing a rating system which would provide ratings by make and model for the following vehicle characteristics:

- . Damage susceptibility
- . Crashworthiness
- . Ease of diagnosis and repair.

During Phase I, two basic methodological approaches were studied: a historical rating methodology using operational field data, and a predictive rating methodology using manufacturer design data and component test data as inputs to computer simulation models. The rating systems studied are described below.

### (1) Historical Methods

The first approach was to base ratings on historical information to rate cars already on the road. During Phase I, such information was gathered from the following sources:

- . Insurance company claims file data supplied by industry associations and data collected directly from individual company files by NHTSA and contractor representatives
- . Automobile manufacturers data on vehicle design and testing experience

- . Accident data from State accident reports
- . Owner maintenance and repair data obtained from leasing car fleets, independent repair shops and a survey of 25,000 car owners.

Based on this data and the use of standard statistical techniques, a number of potential rating approaches were analyzed. Phase I efforts concluded that ratings based on historical data of the following types were most appropriate:

- . Damage susceptibility. Probability that the weighted average damage repair costs for a given make/model are statistically different than the same costs for all other vehicles in the same class. The rating is expressed as "average" if the difference is not significant, otherwise "above or below average."
- . Crashworthiness. The ratio (times 100) of the observed frequency of serious or fatal injuries for a given make/model, to the expected frequency of cars in the same class. The rating can also be expressed as "average", "above average" or "below average" using a statistical test to establish whether or not the difference is significant.
- . Repairability. The expected "life cycle" cost for selected corrective repair actions, during the interval from 12,000 miles (beyond warranty) to 60,000 miles.

## (2) Predictive Methods

Using the field data methods described above and given good quality data in sufficient quantities, automobile ratings by make/model can be developed. However, because this method is strictly historical and the goal is to rate new model year cars, a major portion of the initial program plan was devoted to the investigation of predictive rating techniques. The following approaches were investigated:

- . Computer simulation of vehicle crashworthiness and damage susceptibility. The feasibility of using com-

puter models to simulate vehicle crashworthiness and damage susceptibility characteristics was investigated in Phase I, using automobile make/model and occupant data in conjunction with crash test data on four 1973 intermediate vehicles. While the results of this effort were not conclusive, the basic predictive approach showed enough promise to continue investigation of its feasibility in Phase II. The Phase II effort will investigate two computer modeling approaches. One will use dynamic crash data and the other static data to predict the results of a crash with the "complete" vehicle. These predictions would then be translated into terms that the consumer could understand such as dollar damage in an accident, the probability of serious injury or death given an accident, etc. Phase II efforts will employ crash data on 1974 intermediate vehicles.

- . Predictive repairability approach. An approach has not yet been selected. Several are currently under consideration. Each will be investigated and analyzed in detail in Phase II.

### (3) Summary

Phase I efforts indicated that ratings based upon historical data may be feasible, but that collecting enough historical data from present sources to prepare such ratings would delay publication of the ratings until automobiles had been in service for one or two years. In some cases, make/models with very low sales rates might never have enough accidents or component failures data accumulated to provide sufficient information to prepare ratings.

Predictive rating techniques showed promise, but their feasibility as a rating tool was not clearly established in Phase I and efforts continue in this area.



### 3. CRASH TESTING

To support Phase I efforts to assess the feasibility of predictive ratings methods for damage susceptibility and crashworthiness, a series of crash tests were performed. Intermediate size, four-door sedans of four representative 1973 makes/models were employed. Three vehicles of each make/model were crashed (12 vehicles total.) The testing involved the following cases:

- . 15 mph frontal fixed-barrier impact
- . 30 mph frontal fixed-barrier impact
- . 20 mph front-to-side, car-to-car impact
- . 20 mph front-to-rear, car-to-car impact
- . 15 mph rear impact using a moving barrier.

The test program did not include low speed crashes (5 mph or less). However, damage repair estimates were obtained from the 5 mph bumper compliance tests performed under the Federal Motor Vehicle Safety Standard 215 program. In all cases, car-to-car impacts were with identical make/model cars. The total test program judiciously combined the impact locations of the "target" and "bullet" cars such that the data obtained represented 7 different accident conditions for each of the 4 make/models. Instrumented dummies were used in the tests to assess the vehicle's crashworthiness characteristics. All dummies were restrained using the standard safety belt system available on the particular vehicle.

During Phase II, a component test program consisting of dynamic and static tests is planned to provide additional data inputs to the predictive computer modeling effort. Additionally, the four representative 1974 make/model cars will be subjected to 6 different full-scale crash tests. The testing will be as follows:

- . 8 mph frontal fixed-barrier impact
- . 25 mph frontal fixed-barrier impact
- . 30 mph frontal fixed-barrier impact
- . 35 mph frontal fixed-barrier impact
- . 10 mph front-to-rear, car-to-car impact
- . 20 mph front-to-rear, car-to-car impact

The results of this Phase II effort are expected to provide additional knowledge with respect to the feasibility of using component test data as an input to computer simulation models to predict damage susceptibility and crashworthiness.



#### 4. CONSUMER RESEARCH, INFORMATION DISSEMINATION AND PROGRAM INTEGRATION

The original program plan clearly recognized the need to effectively communicate ratings developed by engineers and statisticians to the public. It also recognized that the impact of the information on consumers depended upon the way in which it was presented and the attitudes and preferences of the consumers themselves. To develop an effective information package, it was necessary to obtain information regarding why consumers buy particular automobiles, what Title II information they would most likely use, and how this information should be presented to have its greatest impact.

The consumer research effort involved the following steps:

- . Literature survey of consumer research related to automobiles. A literature survey conducted early in the program provided a summary of past and present theoretical, experimental and methodological work on automobile buying behavior and identified procedures for disseminating information to a large, heterogeneous population. A major result of the survey was identification of the need to perform a special survey to collect information on consumer automobile buying factors (why people buy the cars they do) which would be required to carry out the succeeding stages of the research plan.
- . Consumer buying factors survey. A mail survey of 4,000 representatives of a national mail panel yielded 2,752 responses and gave insight into automobile attributes valued by consumers in cars they purchase. The results of the survey led to the development of seven trial consumer messages that introduced Title II ratings of crashworthiness, damage susceptibility, and repairability.
- . Group depth interviews using trial messages. Twelve group depth interviews (4 in each of 3 cities) with consumers were conducted to evaluate and refine the seven trial consumer messages down to four for later studies. The level of detail the messages should provide was identified as a key evaluation factor.

Based upon the results of this work, two additional work items are required to complete Phase I consumer research:

- . Personal interview survey of 500 households. This survey will help determine the best of the four concepts developed for information dissemination and will help evaluate the relative impact of the three Title II variables on consumer car choices
- . Group depth interviews using actual brand names. These additional groups will test brand loyalty and other attitudinal and motivation factors that have a major influence on consumers' automobile purchase decision.

A significant finding arising out of Phase I consumer research was consumers' high level of interest for Title II type information. Other significant findings were as follows:

- . Accident repair costs were found to be of little, if any, importance to consumers in purchasing an automobile since consumers were quick to recognize their insurance will cover damage expenses above the deductible amount.
- . Crashworthiness was found to be the most important rating. However, maintenance costs followed closely.
- . The desire for detailed explanations will vary widely among consumers. That is, some consumers will want to know little about how the ratings were developed while others will want to know as much as possible; and while still others will be somewhere in between.
- . Most consumers expressed that information from the government was expected to be far superior to similar information published by the manufacturers. The information campaign must therefore be carefully conducted to assure the information is clearly understood to be a Government finding and not another automobile manufacturer's advertisement.

During Phase II, research will be focused on combining these results with the results of the personal interview survey and additional group depth interviews to select the "best" method(s) for communicating Title II data.

In addition to consumer research activities, this portion of the study also focused on program integration to assure that all aspects of the various research efforts were clearly focused on the primary goal of providing information to consumers which they can use and understand. Included in this role were the following support activities:

- . The collection of maintenance and repair records on approximately 2,000 vehicles owned by members of a national technical society
- . The collection of medical and crash damage repair cost data based on a survey of vehicle owners accident records
- . Coordination and assessment of contractor efforts through constant review of schedules and accomplishments as well as analysis of potential problems.

## 5. SOCIOECONOMIC IMPACT

This program called for two separate and distinct approaches to be employed to assess the potential impact of Title II information dissemination on consumers, automobile manufacturers, the automotive repair and insurance industries, the national economy and society as a whole. The approaches were:

- . Mathematical simulation of Title II effects using models of accidents, new car sales, and operational costs. This effort used various scenarios of market shares by make/model as inputs and predicted direct consequences such as lives saved, fuel used, as well as indirect economic effects.
- . Delphi panels of experts in automotive marketing and automobile dealers to assess, by a group consensus technique, expected sales impacts of various hypothetical Title II results. After a number of anonymous rounds of interaction, these experts predicted impacts for various Title II scenarios. These results were then used to analyze injury/fatality shifts, fuel consumption, repair parts impacts, etc., as in the mathematical simulation approach.

The results of these studies gave a broad outline of potential consequences of Title II under a host of different scenarios. In addition, they were used to guide other contractor inquiries and to estimate whether Title II might produce undesirable consequences.

## 6. PLANS FOR PHASE II

The key elements of Phase II will be:

- . Collection and evaluation of additional historical data sources
- . Crash testing and math modeling to support predictive ratings feasibility analysis
- . Additional consumer research and potentially a dissemination of preliminary ratings to assess impact of Title II information.



## II. THE TITLE II PROGRAM: GOALS AND OBJECTIVES

In October 1972, the Congress enacted legislation entitled the "Motor Vehicle Information and Cost Savings Act (Public Law 92-513)." Title II of this legislation was aimed at reducing the total cost of car ownership to consumers and promoting competition among motor vehicle manufacturers in the design and production of safer, more durable, and more easily repairable automobiles. Title II would achieve these objectives through the collection and distribution, by the U. S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), of information on the damage susceptibility, crashworthiness, ease of diagnosis and repair, and insurance costs of specific makes and models of automobiles. This chapter summarizes the specific objectives of Title II, and the study plan developed by the NHTSA to carry out the obligations imposed on the Secretary of Transportation. The chapter is divided into the following two sections:

- . Title II objectives
- . Study plan.

### 1. TITLE II OBJECTIVES

Title II directs the Secretary to conduct a research program and following the program to develop a consumer information package presenting information about the damage susceptibility, crashworthiness, repairability, and insurance costs of automobiles. It was the hope of the Congress that the consumer, armed with such information, would make a more informed automobile purchase by selecting a vehicle with the best damageability, safety and repairability features. Furthermore, it was hoped that the potential for this type of informed purchasing would stimulate competition among automobile manufacturers to produce vehicles that are safer and less costly to operate and are less susceptible to damage. Savings to the consumer would derive from reduced maintenance costs, reduced losses in accidents (both injury and property damage) and reduced insurance costs.



The Act calls for the following specific actions to be taken by the Secretary of Transportation:

- . Conduct a comprehensive study and investigation of the methods for determining the damage susceptibility, crashworthiness, and ease of diagnosis and repair of automobiles.
- . Make specific recommendations for the further development of existing methods or for the development of new methods.
- . Devise specific ways in which existing information and information to be developed relating to the Title II characteristics can be communicated to consumers so as to be of benefit in their automobile purchasing decisions.
- . Furnish the information to the public in a simple and readily understandable form to facilitate comparison among the various makes and models of automobiles based upon their Title II characteristics.
- . Establish procedures requiring automobile dealers to distribute to prospective purchasers, information developed by the Secretary and provided to the dealers, which compares differences in insurance costs for different makes and models based upon differences in damage susceptibility and crashworthiness.

## 2. STUDY PLAN

NHTSA has developed and is implementing a two-phase feasibility study aimed at development of a system for rating cars, and a method for disseminating to the public information produced by a successful system(s). Phase I of this program was intended to develop a preliminary methodology for rating automobiles according to the characteristics of damage susceptibility, crashworthiness, and ease of diagnosis and repair; and to investigate various ways of communicating that information to the public. Phase II calls for a refinement of the Phase I methodology and application to high volume car models in a single market class. If all of this effort is feasible, then an initial consumer information package will be produced by the end of calendar year 1975. To carry out the proposed program, the following concurrent efforts were undertaken:

- . Development of vehicle rating criteria and methods of determining the damageability, crashworthiness and repairability of automobiles
- . A vehicle crash test program to support the development and demonstration of the ratings
- . A study and analysis of the automobile purchase decision process of consumers, to identify the most appropriate methods for presenting vehicle rating information to consumers and integrate Title II activities
- . An analysis of the nature and extent of potential beneficial and adverse consequences of Title II implementation for various groups and enterprises, and for society as a whole.

Each effort is briefly discussed below. Chapter III of this report discusses in detail the objectives, major accomplishments and results of each study effort to date.

- . Vehicle Rating Criteria Study. The purpose of the vehicle rating criteria study is to select and develop the necessary analytic tools necessary for rating the damage susceptibility, crashworthiness, and repairability characteristics of automobiles. General Electric Company, Information Systems Programs, is the contractor responsible for analytical development of the vehicle rating systems mentioned above. The principal outputs of this study are to be:
  - The criteria to be used in evaluating the vehicle characteristics
  - The classification scheme of vehicle by make/model
  - The method(s) available for constructing vehicle ratings

- The sensitivity or fineness of each alternative rating scale
- The data required to support each rating methodology.

GE is to investigate all feasible solutions to the problem and potential data sources; develop a rating system for insurance cost comparison purposes; and survey existing and ongoing research on mathematical models which may be capable of predicting the damage susceptibility and crashworthiness of automobiles.

- . Crash Test Program. The crash test program is designed to verify the ratings systems being developed by GE. The test work is divided between two contractors (Calspan Corporation and the Dynamic Science Division of Ultra-systems, Inc.) to allow cross-checking of results and to accelerate the test schedule. Selected tests are providing controlled medium to high speed crash data for intermediate class automobiles for two model years. The tests represent idealized forms of common crash modes and are representative of survivable crashes and crashes which result in repairable damage. Dynamic and static tests are also being conducted on particular automobile components to support the development of the ratings systems using mathematical simulation.
- . Information Dissemination and Program Integration Study. This effort is concerned primarily with the development and evaluation of alternate methods and media for effective dissemination of the automobile consumer information. Booz, Allen & Hamilton has primary responsibility for this study and through its National Analysts division and Spiro & Associates, an advertising firm, is to develop a simple and readily understandable "consumer information package." Various forms and procedures for disseminating Title II and trade-off analyses are to be performed by Booz, Allen to insure that the method selected satisfies the full intent of the law. Dissemination alternatives are to be investigated including TV, radio, newspaper advertising and information stickers on cars. In addition to developing a

method for communicating Title II information, Booz, Allen is responsible for assisting NHTSA in scheduling and coordinating the activities of the other contractors.

- . Socioeconomic Impact Study. The primary purpose of this effort is to provide relevant and meaningful information on potential beneficial and adverse consequences of Title II implementation. Specifically, the effort is intended to:
  - Examine the significant economic, environmental, safety, and other trade-offs given consumer and automobile manufacturer reactions to the publication of automobile consumer information.
  - Anticipate both major and minor effects of the Title II program to guide it in the direction of maximum societal benefit.

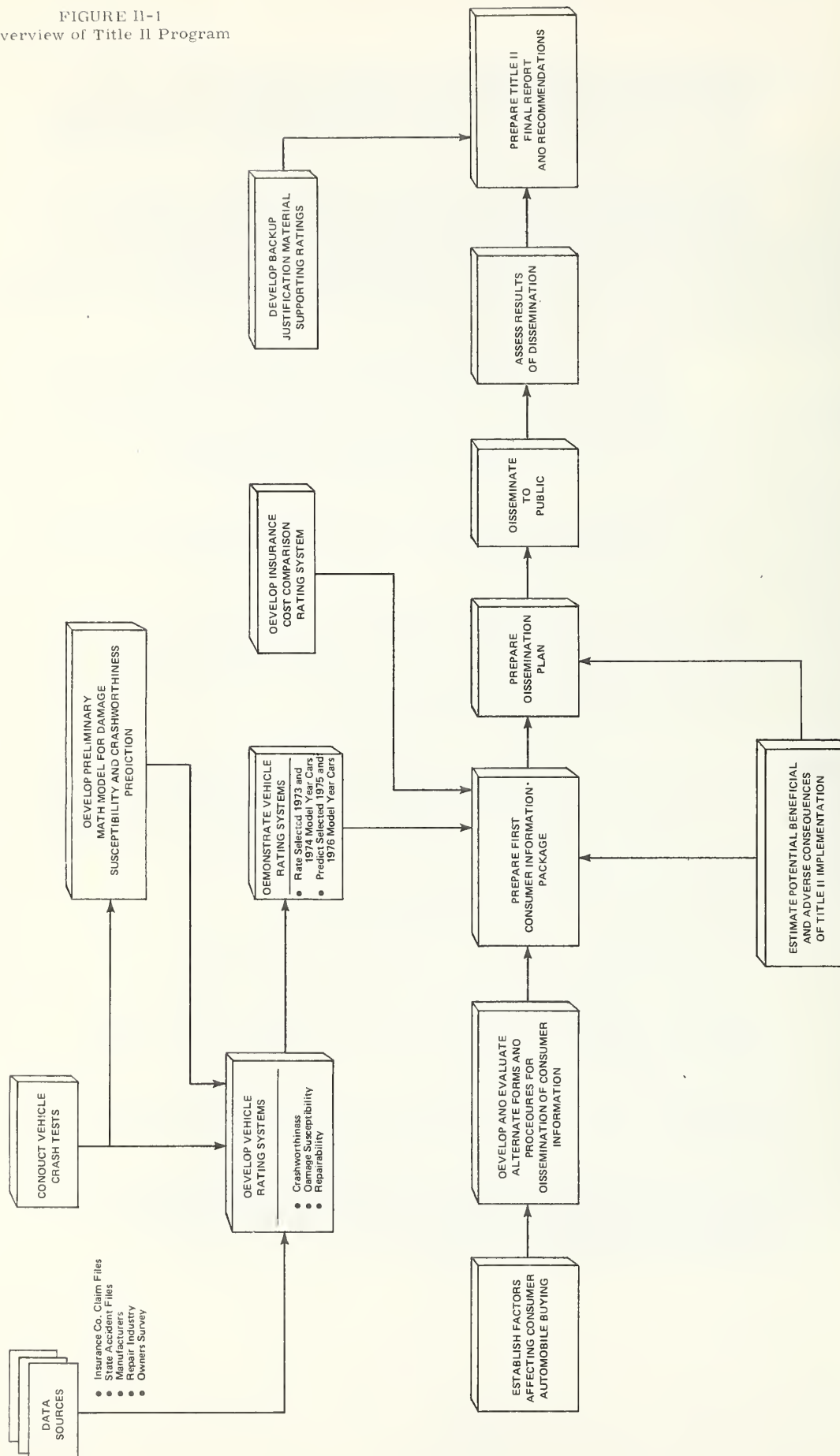
The NHTSA chose two very different parallel study approaches for achieving the above objectives and awarded 10-month study contracts to Arthur D. Little and Center for the Environment and Man, Inc.

Figure II-1 summarizes the interrelationships among the above studies and the major data and information inputs required to accomplish them. The major activities displayed in this figure as summarized in the text are the following:

- . Development of vehicle rating systems
- . Demonstration of these vehicle rating systems
- . Conduct of crash tests to support the demonstration of vehicle rating systems
- . Development of an insurance cost comparison rating system
- . Development and evaluation of alternate forms and procedures for dissemination of consumer information embodying the above ratings



FIGURE 11-1  
Overview of Title II Program





- . Preparation of the first consumer information package
- . Dissemination and testing of the first consumer information package
- . Development of backup justification material supporting the ratings
- . Development of a preliminary mathematical model for prediction of damage susceptibility and crashworthiness
- . Estimation of beneficial and adverse consequences of Title II implementation.

The following chapter summarizes the major accomplishments and results of each study effort to date.



### III. SUMMARY OF PHASE I RESULTS

This chapter summarizes the results of each research activity performed during Phase I. The results are presented in accordance with each contractor study and are provided under the following four headings:

- . Vehicle rating criteria study
- . Crash test program
- . Information dissemination and program integration study
- . Socioeconomic impact study.

#### 1. VEHICLE RATING CRITERIA STUDY

Phase I of the vehicle rating criteria study was aimed at developing preliminary methodologies for rating automobiles according to the characteristics of damage susceptibility, crashworthiness, and repairability. The Phase I objective has been met and preliminary methodologies have been developed for rating each of the above vehicle attributes. Phase II of the study will be aimed at refining the Phase I methodologies and applying them to high volume car models in a single market class.

In this section, the preliminary vehicle rating system methodologies (criteria) as prepared by General Electric during Phase I are discussed. Emphasis is placed on the conceptual framework of each rating system rather than the computational details. For each rating system, two methodologies are presented: (1) historical rating methodology using field data; and (2) predictive rating methodology using manufacturer design data and component test data as inputs to computer simulation models. Each system is discussed separately as follows:

- . General approach to ratings development
- . Damage susceptibility vehicle rating system development
- . Crashworthiness vehicle rating system development
- . Repairability vehicle rating system development.

## (1) General Approach to Ratings Development

In developing the ratings, General Electric proceeded in four basic steps:

- . Identification and review of existing concepts
- . Design and development of new approaches
- . Analysis and evaluation of alternatives
- . Selection and refinement of feasible alternatives.

During the first few months of the program, a literature survey was conducted to gather information pertinent to the development of vehicle ratings. Numerous research papers, technical journals and other information sources were investigated and used in the formulation of alternative rating approaches. Each alternative was analyzed and evaluated in terms of program resources, cost, time and effectiveness. The most promising approaches were then selected for future development.

Two approaches were developed for each system:

- . A historical rating system based on historical field data which would allow for the rating of models already on the road
- . A predictive rating system based on the acquisition of manufacturer design data supplemented by selected component test data, as inputs to computer simulation models, which would allow for the rating of new model year cars.

## (2) Damage Susceptibility Vehicle Rating System Development

The objective of the damage susceptibility vehicle rating system is to develop a methodology suitable for measuring the susceptibility of various passenger motor vehicles to damage which would be sustained in accidents and to rate these cars accordingly. The first step in constructing such a methodology was to determine the most useful and meaningful way to measure or evaluate the extent of damage incurred in a motor vehicle accident. Measurements considered were:



- . Amount of crush. A measurement usually in inches of the deformation of certain vehicle structural components measured after a crash.
- . Traffic accident damage (TAD) rating. A method of determining the extent of damage sustained by a motor vehicle in an accident by matching observed damage with photographs of "standard" damages. The rating uses a seven point scale for each impact region.
- . Vehicle damage index (VDI). Index relating to the extent of damage sustained in an accident to a standard zone of deformation, within an impact region. Rating on a 1 to 9 scale, for each impact region.
- . Damage repair cost. The cost to repair the damage sustained by a motor vehicle in an accident including both the costs of parts and labor necessary to restore the vehicle to its preaccident condition. Several methods of computing cost-to-repair were investigated by General Electric. These are as follows:
  - Cost-to-repair for comparable accident conditions
  - Average cost-to-repair.
- . Average collision claim payment per insured year. The average payment by an insurance company for collision/property damage per insured vehicle year. Computation of this measure takes into consideration vehicle exposure, collision claim frequency, average loss payment per insured vehicle year, and deductible collision coverages.
- . PROB measure of damage. Probability that a given make/model costs less to repair than the market class as a whole. This probability is determined from the distribution of costs to repair for the particular make/model and the distribution of costs to repair for all other cars in the same market class.
- . Damaged parts inventory. Tabulation of damage sustained in a crash based on a list of critical parts.

PROB was the measure of damage selected to rate damage susceptibility vehicle characteristics for the historical rating methodology. For the development of a predictive methodology, inches of crush were converted into dollar values for replacement of parts in the damaged zone and total value accumulated. Procedures developed to produce damage susceptibility ratings are discussed in the following sections.

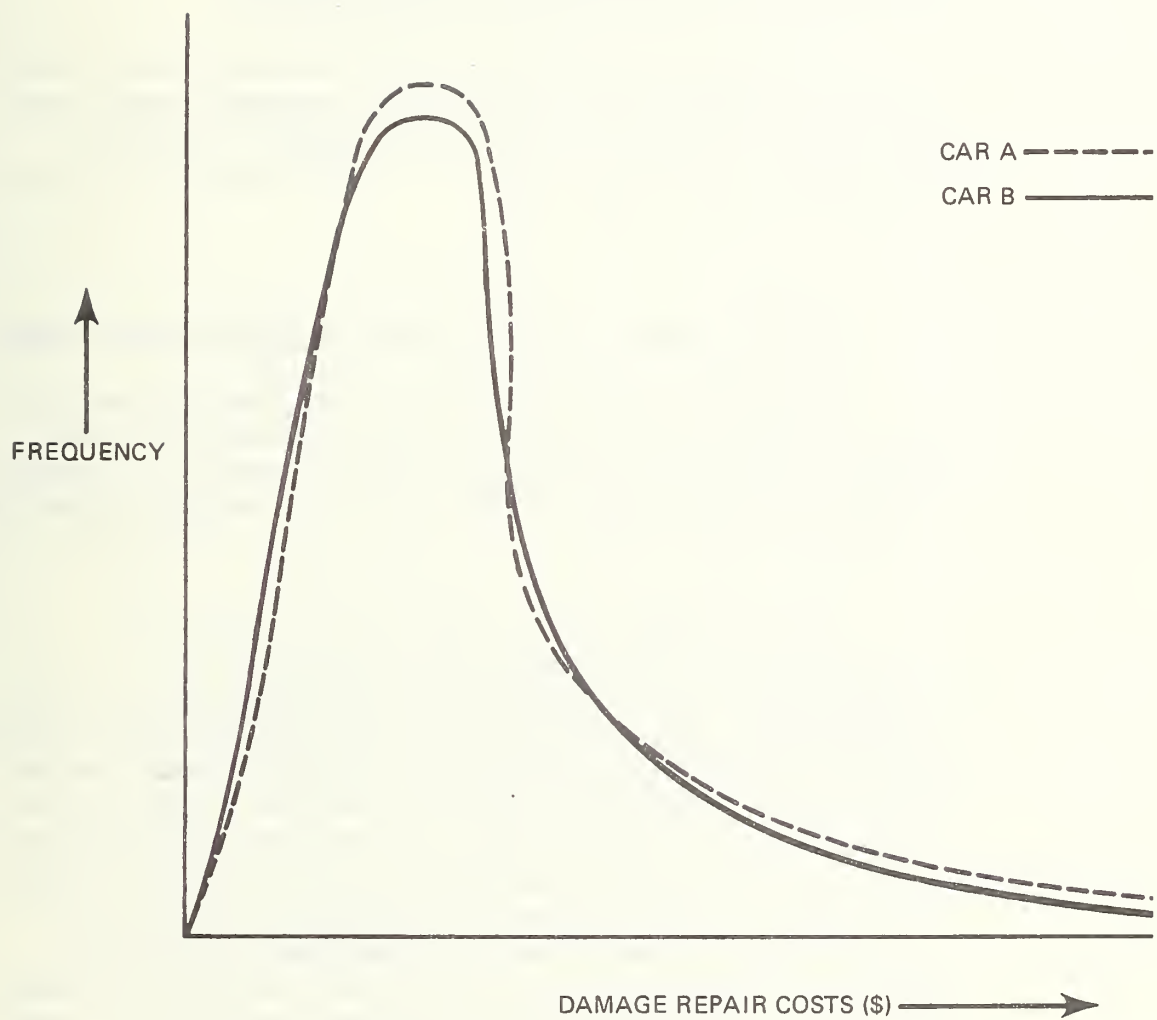
### 1. Damage Susceptibility Historical Rating Methodology

The measure for rating damage susceptibility based on historical accident data was the probability that a given car (car A) costs less to repair than any other car in the same car class. This measure was defined as PROB, and is illustrated below.

Suppose that car A is a specific make/model within a particular market class of cars (i.e., subcompact, compact, intermediate, standard, luxury, sport). Let us for convenience, designate by car B the market class under consideration with car A excluded. Furthermore, assume that there exists sufficient data to determine the frequency distribution of damage repair costs for cars A and B as shown in Figure III-1. PROB is a measure of the difference in repair cost distributions for cars A and B. That is, if cars A and B have identical repair cost distributions, then 50% of the time car A will cost less to repair than car B and vice-versa (i.e.,  $\text{PROB} = 0.5$ ). PROB is a number between 0 and 1 and will deviate from 0.5 only if cars A and B have different repair cost distributions. The higher the value of PROB, the better are the damage susceptibility qualities of a particular car.

PROB is related to what is referred to in the statistical literature as the Mann-Whitney form of the Wilcoxon test and has associated with it a test of significance. The purpose of the significance test is to determine whether or not the hypothesis that cars A and B have the same repair cost distribution is true. If the hypothesis holds, then car A will be assigned an "average" rating indicating there is indeed no statistical difference in the repair cost distributions of car A and all other cars of the same class.

FIGURE III-1  
Hypothetical Repair Cost Distribution  
for Car A and Car B



On the other hand, if the hypothesis is rejected, then the rating assigned to car A will depend on the resulting value of PROB. That is, if PROB is significantly greater than 0.5, the car would be rated "above" average and if PROB is significantly less than 0.5, the car would be rated "below" average in terms of possessing good or poor damage susceptibility qualities respectively.

The data used during Phase I to compute the values of PROB for each make/model were accident repair cost data received from State Farm and Allstate insurance companies. During Phase II, data will be collected from 25,000 insurance claim files.

## 2. Damage Susceptibility Predictive Rating Methodology

The approach selected to produce damage susceptibility ratings for new model year cars consists of three steps: (a) computer simulation of motor vehicle accidents, (b) engineering analysis of manufacturer design changes, and (c) engineering analysis of selected component tests.

Vehicle spring/mass models were employed to represent the front and rear structures of automobiles in a crash environment. The models are capable of simulating with varying degrees of accuracy car-to-fixed barrier, car-to-moving-barrier, and car-to-car crashes. Each vehicle is approximated by up to four masses linked by springs. Input data required to operate the models consists of the structural characteristics in the form of force-deformation relationships of a selected list of automotive components or assemblies of components. Component tests were performed on the automotive hardware to obtain the required input data which was represented in the model by nonlinear springs or energy absorbing elements. The model simulates the response of the vehicle in a crash situation by solving a set of nonlinear simultaneous equations which characterize the vehicle as a set of hypothetical masses connected by hypothetical springs.



The primary outputs of the model are measurements of dynamic crush of the critical components (parts), and the accelerations of the major vehicle masses. By comparing the displacement values for each component to the actual dimensional layout of the vehicle, an inventory of damaged parts can be compiled. Finally, by preparing an estimate of the cost of parts and labor to repair each item on the damaged parts inventory, an overall estimate of the costs to restore the vehicle to its preaccident condition can be made. Repeating the above procedures for each accident condition (given a model which can accurately simulate these conditions) will provide an estimate of the average cost-to-repair a specific vehicle in an "average" accident.

To predict the effectiveness of damage characteristics on new model year cars, one would identify and analyze significant design changes, conduct component tests where necessary, and rerun the models. A schematic of the overall procedure is displayed in Figure III-2. During Phase II, modeling work will concentrate on improvement of existing math models for front and rear end crashes.

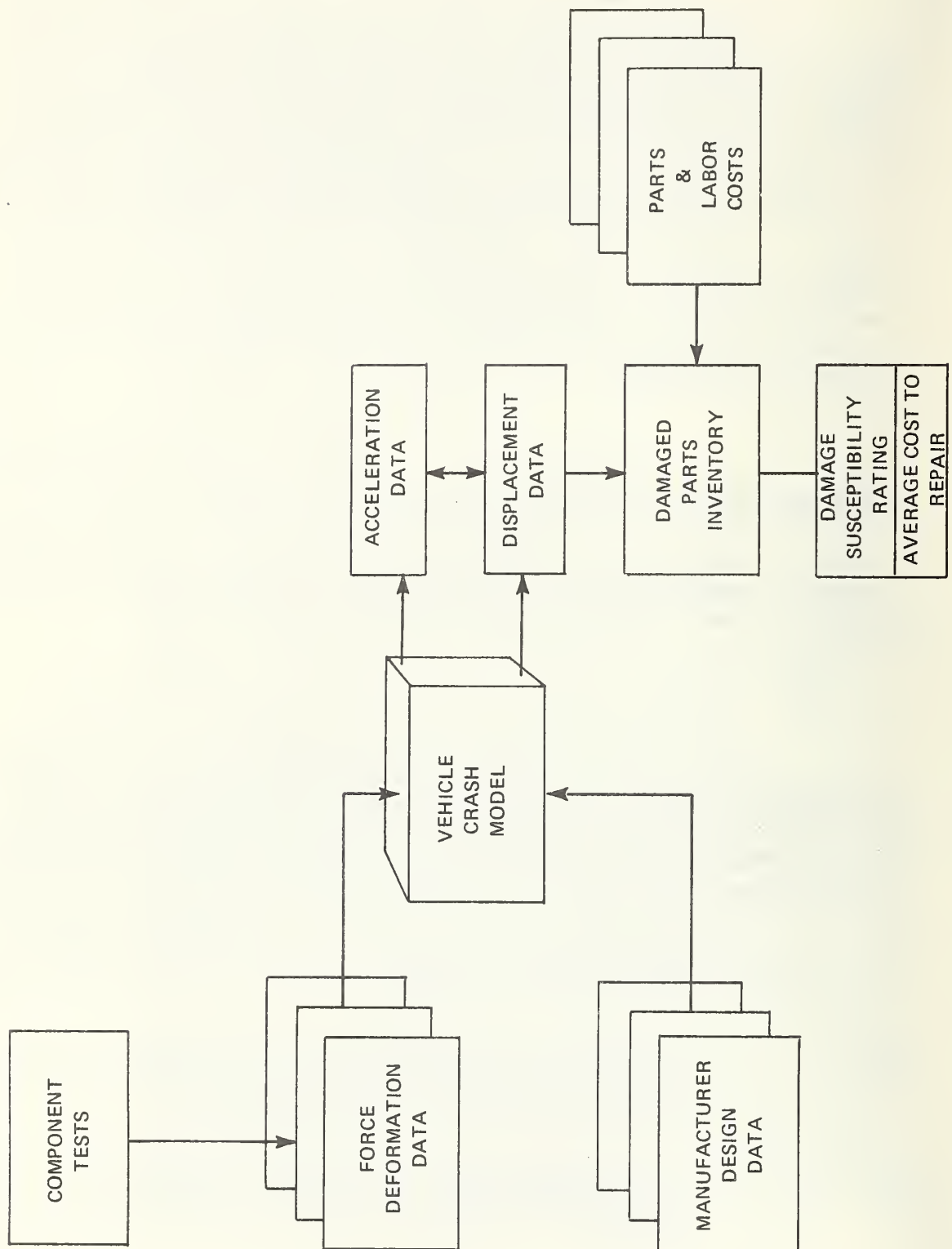
### (3) Crashworthiness Vehicle Rating System Development

The crashworthiness vehicle rating system is intended to measure the extent to which various passenger motor vehicles protect their occupants against personal injury or death as a result of a motor vehicle accident and to rate these cars accordingly. As in the damage susceptibility rating system development task, the first step in constructing a methodology for crashworthiness was to investigate the various ways in which the degree of vehicle crashworthiness could be measured. The measures that were considered were the following:

- Societal cost of fatal and serious injuries. Assignment of monetary values to injuries and deaths resulting from motor vehicle accidents
- Mean injury level. Measure of crashworthiness based on indices of injury severity (i. e., head, chest, femur)



FIGURE III-2  
Overview of Damage Susceptibility  
Predictive Rating Methodology



- . Probability of fatality or serious injury. Probability that the occupant or occupants of a motor vehicle will be fatally or seriously injured given that the car is involved in an accident.
- . Crashworthiness index. Ratio of summed observed to summed expected frequency of injuries over all accident conditions
- . Injury severity score. Numerical description of the overall severity of injury for occupants who have sustained injury to more than one area of the body.

The historical measure of crashworthiness selected was the crashworthiness index, and is based on the work pioneered by the University of North Carolina Highway Safety Research Center. The predictive measure of crashworthiness selected was the injury severity score developed by researchers at Wayne State University. Each approach is described in detail below.

#### 1. Crashworthiness Historical Rating Methodology

The historical methodology is based upon a test of the hypothesis that there is no statistical difference in the degree to which one car protects its occupants from fatal or serious injury than the other cars of the same market class taken as a whole. That is, if the above hypothesis is true, then one could expect the distribution of fatal or serious injuries by accident type for the particular make/model to be the same as the distribution for the reference group. The general theory upon which this hypothesis is based is referred to in statistical literature as "contingency table analysis." This is described below.

Combinations of speed, crash types (e.g., car-to-car, car-to-fixed object,) and impact regions (e.g., front, side, rear) are used to define various accident situations or types. For each situation, the "observed" number of fatal or serious injuries for a specific make/model is determined (from records of insurance claim files) and compared against the number of fatal or serious injuries that would be "expected" if that car was not different than

the reference group. An index is computed by taking the ratio of observed to expected frequencies of fatal and serious injuries summed over all accident conditions. The resulting figure is then arbitrarily multiplied by 100 for convenience. Thus, for a particular car, if the hypothesis stated above were true, one could expect the resulting index value to equal 100. That is, the crashworthiness characteristics of the car would be no better or worse than the reference group. On the other hand, an index value that falls below or above 100 would indicate that car has either superior or inferior crashworthiness characteristics when compared to the reference group.

To determine whether the resulting index value is statistically different from 100, a chi-square statistical test of significance is employed. Based on the outcome, a rating of "average", "above average", or "below average" is assigned to each car. The data bases used to determine the frequency of fatal and serious injuries by accident type for this effort were the North Carolina and New York police accident files. During Phase II, data obtained by GE from a survey of 25,000 insurance companies claim files will be used.

## 2. Crashworthiness Predictive Rating System Methodology

The approach developed to predict crashworthiness ratings for late model year cars is similar to the approach used for predicting damage susceptibility ratings, except that an additional computer model is employed to describe the effect that a given crash has on the vehicle occupant.

A three-dimensional mathematical model of the occupant is used to simulate his response to the crash condition imposed upon the vehicle. The occupant is represented by 11 masses and 10 joints. Input data to the model include the geometric configuration of the vehicle compartment, properties of the restraint system and seating position. The acceleration loads on the occupant compartment as obtained from the

vehicle crash model simulation (used in the analysis of predicting damage susceptibility ratings) drives this second or occupant model simulation of the crash response. The outputs of this second model are simulated values of head and chest accelerations and femur loads that would be experienced by the occupant in an actual crash situation.

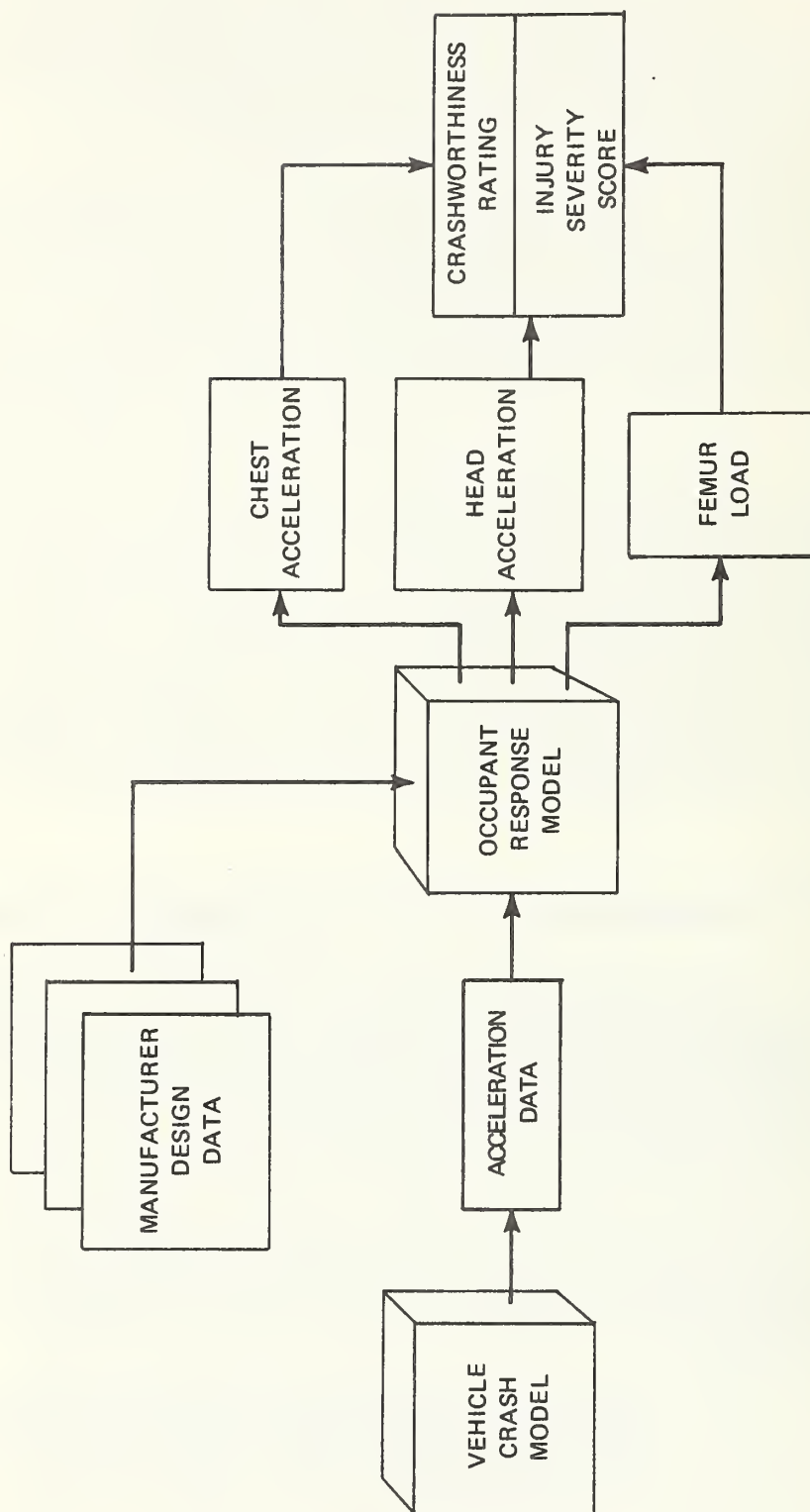
The model is run for several crash situations and the results obtained are combined using a technique developed by researchers at Wayne State University to produce an overall injury severity score. The score, which is a number between 0 and 100, represents the degree of protection afforded the occupant when that vehicle is involved in an accident. The greater the number, the more crashworthy are the vehicle's characteristics and the greater the protection afforded its occupants. To predict the crashworthiness characteristics of subsequent year car models, one would input data describing manufacturers design changes or conduct component tests for models with significant changes. These would be inputs to the models. The same procedure outlined above would then be repeated. The entire process is displayed schematically in Figure III-3. During Phase II, modeling work will concentrate on improvement of existing models for front and rear end crashes.

#### (4) Repairability Vehicle Rating System Development

The repairability vehicle rating system is intended to determine the ease of diagnosis and repair of mechanical and electrical systems of passenger motor vehicles which fail during use, and to rate these cars accordingly. For this report, "ease of diagnosis and repair" is referred to as the "repairability" characteristics of passenger cars. As in the previous rating system tasks, the first step in constructing a rating system for repairability was to investigate the various ways of measuring the repairability characteristics of different passenger motor vehicles. The following measures were investigated:

- . Labor time estimated for all preventive and corrective maintenance repairs over a given time period
- . Labor time required to complete selected maintenance actions

FIGURE III-3  
Overview of Crashworthiness  
Predictive Rating Methodology





- . Total cost of parts over a given time period
- . Total cost of labor over a given time period
- . Total cost of parts and labor for preventive maintenance over a given time period
- . Total cost of parts and labor for corrective maintenance over a given time period
- . Combined total cost of parts and labor for both preventive and corrective maintenance over a given time period
- . Estimated average cost of parts and labor for selected preventive and corrective maintenance repairs over a given time period.

The measure selected by GE as a means of historically rating the repairability characteristics of passenger motor vehicles was the average annual cost of combined preventive and corrective maintenance actions based on a list of automotive critical parts. The following sections describe the historical and proposed predictive rating methodology developed by GE. No final selection of a predictive methodology for repairability was made during Phase I. Alternative methodologies currently under consideration and planned for evaluation in Phase II, are included in the following discussion.

1. Repairability Historical Rating System Methodology

Maintenance costs, in general, are a function of two basic variables: the cost of parts and labor, and the maintenance frequency. Accordingly, the approach devised by General Electric takes into account the above two variables and is composed of the following two systems:

- . A system for estimating the average annual costs of parts and labor for preventive maintenance activities
- . A system for estimating the average annual costs of parts and labor for corrective maintenance activities.

The first step in estimating the annual repairability costs of operating a motor vehicle was to select a list of automotive components upon which to base the calculations. Since there are thousands of parts which make up the modern passenger car, the following criteria was employed in the selection of parts:

- . Preventive maintenance. All parts which had a direct financial impact on the car owner (from the owner's maintenance manual for new cars) were selected. Parts were eliminated where inspection or check actions did not require removal of parts or the use of significant labor.
- . Corrective maintenance. All parts involving a mechanical or electrical component essential to the proper operation of the vehicle and accounting for at least one percent of the failures reported for a particular vehicle type were selected.

The next step in the process was to select a source of labor and part cost information to be used in the calculations. Two basic sources of labor and part cost information were considered: (1) the part price lists and flat rate manuals supplied by automobile manufacturers and (2) the repair industry's flat rate manuals. Gas stations, specialty shops, and department store chains which have their own rate structure were not considered as viable sources of information since they do not cover the entire spectrum of maintenance and repair operations. The data source ultimately selected by GE was the Mitchell flat rate manual. All estimates were based on the replacement of failed components with new parts. In the event

that labor and parts costs were unavailable, engineering estimates were used.

The final and most difficult step in the process was the determination of maintenance frequency. Since many factors influence the frequency with which repair operations are performed, the following methodology was employed to determine frequency intervals for preventive and corrective maintenance operations:

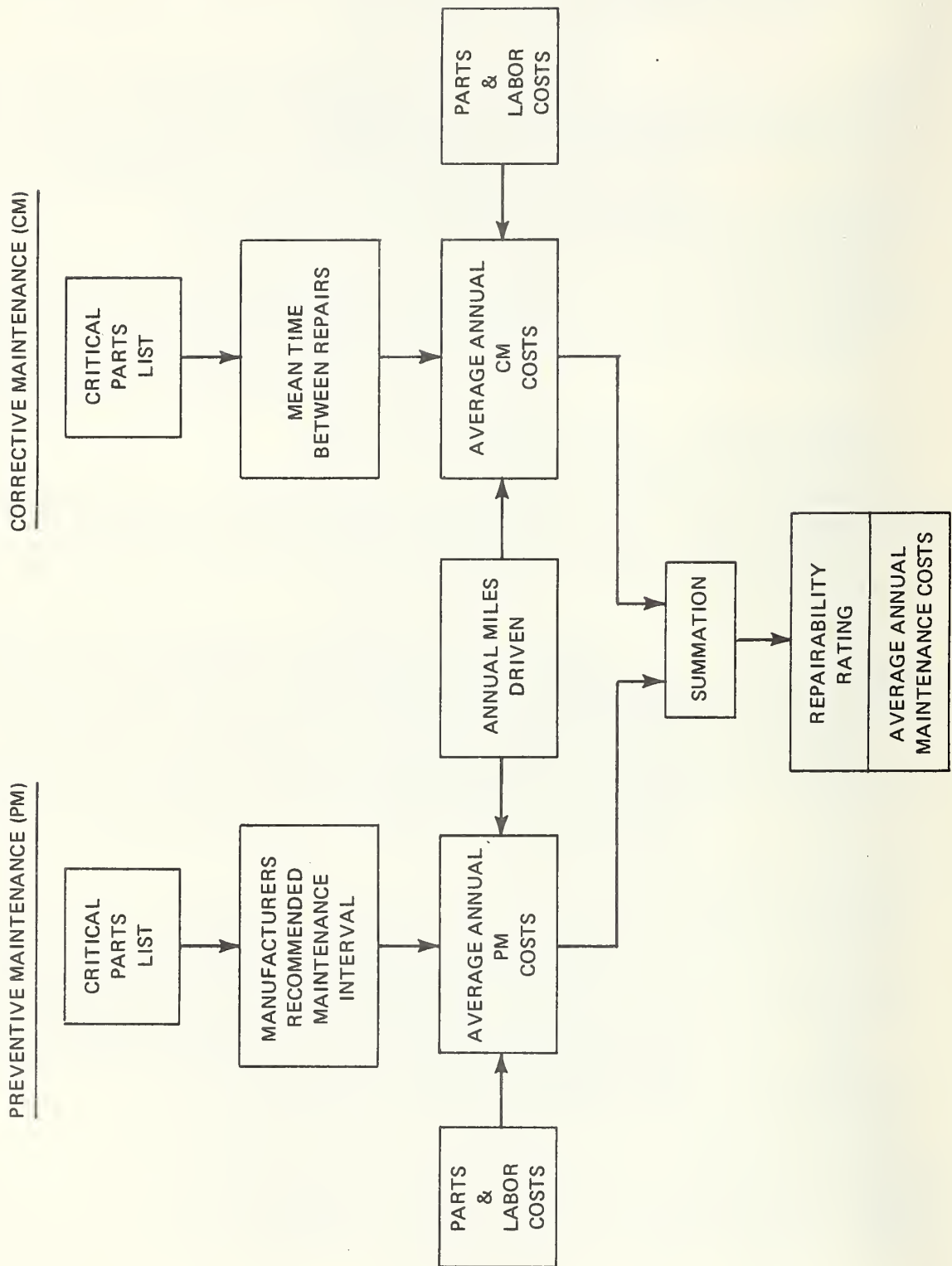
- Preventive maintenance. Assume the manufacturer's maintenance schedule is followed during the warranty period of the car and apply a correction factor to the manufacturer's recommendations for all post warranty maintenance and repair
- Corrective maintenance. Determine the failure time distribution using available field data and calculate the mean time between repairs.

The costs of performing the preventive and corrective maintenance are determined by multiplying the frequency of maintenance by the cost of parts and labor for each of the critical parts. The sum of these costs divided by the number of miles driven annually yields an estimate of the annual costs of maintaining an automobile. An overview of the entire process is represented graphically in Figure III-4.

## 2. Repairability Predictive Rating System Methodology

No final selection of a predictive rating methodology was made during Phase I. Several are currently under consideration (see below). Each will be investigated and analyzed in detail in Phase II.

FIGURE III-4  
Overview of Repairability  
Historical Rating Methodology



- . Failure modes and effect analysis (FMEA) approach. This technique involves the detailed analysis of each component in an assembly, defining the potential failure modes of each component and, based on historical data, determining the failure rate for each failure mode.
- . Manufacturer's petition approach. In this approach, an automobile rating will be established based on historical data from the previous model year. This same rating would then be applied to the new model car unless the car manufacturer petitions the NHTSA for a rating change. At that time, the manufacturer would be asked to justify the fact that the change would change the rating of his vehicle.
- . Delayed rating approach. Under this approach, an automobile will carry the rating, developed using historical data, from previous model years until enough historical evidence is available to justify a rating change on the newer model car. In other words, when a significant design change is implemented, the car rating will not be changed, only annotated, until enough historical data is accumulated to justify a recomputation of the rating.
- . Expert panel approach. This approach involves the convening of a group of knowledgeable people (an expert panel) to review a particular design change and estimate the impact of that design change on the repair frequency of the component involved.



## 2. CRASH TEST PROGRAM

To support the development of vehicle ratings, a crash test program was implemented to provide crash and component test data on selected intermediate class automobiles for two model years. The tests conducted represented idealized forms of common crash modes and crashes which result in repairable damage. Lap belts and shoulder harnesses were used in all tests. The test work was divided between two contractors, Dynamic Science Division of Ultrasystems, Inc. and Calspan Corporation. The first series of crash tests have been completed. The test program and results are discussed under the following headings:

- . Test conditions and procedures
- . Test cars
- . Test array.

### (1) Test Conditions and Procedures

Standard practice was followed in the tests to the maximum extent possible. In all tests the ignition was off, the fuel system was flushed and filled with Stoddard solvent to at least 95 percent capacity, the brakes were released, and the transmission was in neutral. Anthropomorphic dummies conforming to Part 572 of the United States Code of Federal Regulations were used and the dummies were restrained using the standard safety belt system in the vehicles.

Each vehicle was used more than once during the test program. Practicing insurance adjusters were employed to assess vehicle damage, and an independent auto repair shop was used to refurbish vehicles requiring complete repair. Only parts significantly contributing to intrusion and energy management and thus representing a major repair cost were repaired. Purely cosmetic parts were not restored or replaced, but were considered in calculating the total cost of repair. All repair cost information was used as input for the damageability analysis.

## (2) Test Cars

The intermediate size four-door sedan was selected as the test car, and four "representative makes and models," one from each of the four major American manufacturers, was selected for testing. Calspan conducted crash tests on the 1973 Satellite and Torino and the Dynamic Science Division of Ultrasystems, Inc. conducted similar tests on the 1973 Chevelle and Matador. All cars were as identical as practicable and included as installed equipment a V-8 engine, automatic transmission, air conditioning, power steering, standard restraint systems and standard interiors. Three cars of each model were procured and subjected to a series of crash tests consisting of rigid barrier impacts, moving barrier impacts, and vehicle-to-vehicle impacts. Each car was refurbished as necessary for use in more than one test. Phase II crash tests will be conducted on 1974 models of the same cars.

## (3) Test Array

Five different tests were conducted on each of the four intermediates. The array of tests conducted is shown in Table III-1. As noted in the table, the test program did not include low speed crashes (5 mph or less). At such speeds damage and injuries are minimal. However, damage data on low speed crashes (5 mph or less) were obtained from bumper compliance tests conducted under Federal Motor Vehicle Safety Standard 215. Therefore, the Title II crash test program included only higher speed tests representing situations in which significant damage and injuries are likely.

In addition to the crash test data, Dynamic Science, as subcontractor to the ratings development contractor, performed selected dynamic component tests on the 1973 Torino and Satellite to obtain data to support the predictive damage susceptibility math modeling analysis. Front, side and rear tests were conducted on components of the Torino. Frontal test data were made available by Chrysler Corporation for the Satellite and only side and rear tests were conducted on that vehicle. The component test data obtained was used to develop force-deformation curves to define the dynamic response of selected parts of the vehicle structure to impact forces. The curves constructed were as follows:

Table III-1  
Phase I Crash Test Program

Test Condition	Target	Impact Speed
1. Front-to-barrier	Fixed barrier	15 mph
2. Front-to-barrier	Fixed barrier	30 mph
3. Front-to-side	Stationary car	20 mph
4. Front-to-rear	Stationary car	20 mph
5. Moving barrier- to-rear	Stationary car	15 mph

- . Radiator/engine/driveline response to frontal impact
- . Bumper/front sheet metal/frame reaction to frontal impact
- . Side sheet metal/frame reaction to side impact
- . Bumper/rear sheet metal/frame reaction to rear impact.

During Phase II an expanded component test program will be conducted to provide more accurate inputs to the model.

### 3. INFORMATION DISSEMINATION AND PROGRAM INTEGRATION STUDY

If Title II ratings can be developed, DOT is directed by Public Law 92-513 to make them available to the public in a simple and readily understandable manner. Booz, Allen & Hamilton and Spiro & Associates, an advertising firm, began a comprehensive research study in July 1974 to evaluate alternate methods of communicating the Title II information to the public. This study consisted of four stages: a literature search, a mail panel survey, group depth interviews, and a national survey.

The first step in the plan, the literature search, provided the program with an overview, and compendium of information reported in the published literature on consumer buying behavior. It delineated the history of prior efforts, and identified the areas where subsequent research was needed to develop preliminary campaign strategies and consumer information messages for the program.

The second stage in the plan, the mail panel survey, provided information on consumer automotive buying factors. This information, in conjunction with information sources from other parts of the Title II program, was used to develop seven trial consumer messages. The messages introduced ratings, (hypothetical data constructed for research purposes) for the crashworthiness, damage susceptibility and repairability attributes of different automobiles and represented the first cut at communicating this Title II information.



Several group depth interviews (discussions) with consumers were then conducted to evaluate and refine the seven trial consumer messages. Four refined messages were prepared based on consumer response to the messages in the group discussions plus the interim findings of GE with respect to the feasibility of different rating systems. A national personal interview survey of 500 respondents and an additional series of group depth interviews is currently underway to assess the effectiveness of these refined messages.

The entire process is represented schematically in Figure III-5. This section of the report presents the preliminary results of the first three stages of the effort to develop the first Title II consumer information package and includes a discussion of Booz, Allen's program integration role during Phase I. A separate discussion of the design of the national survey is provided in Appendix E.

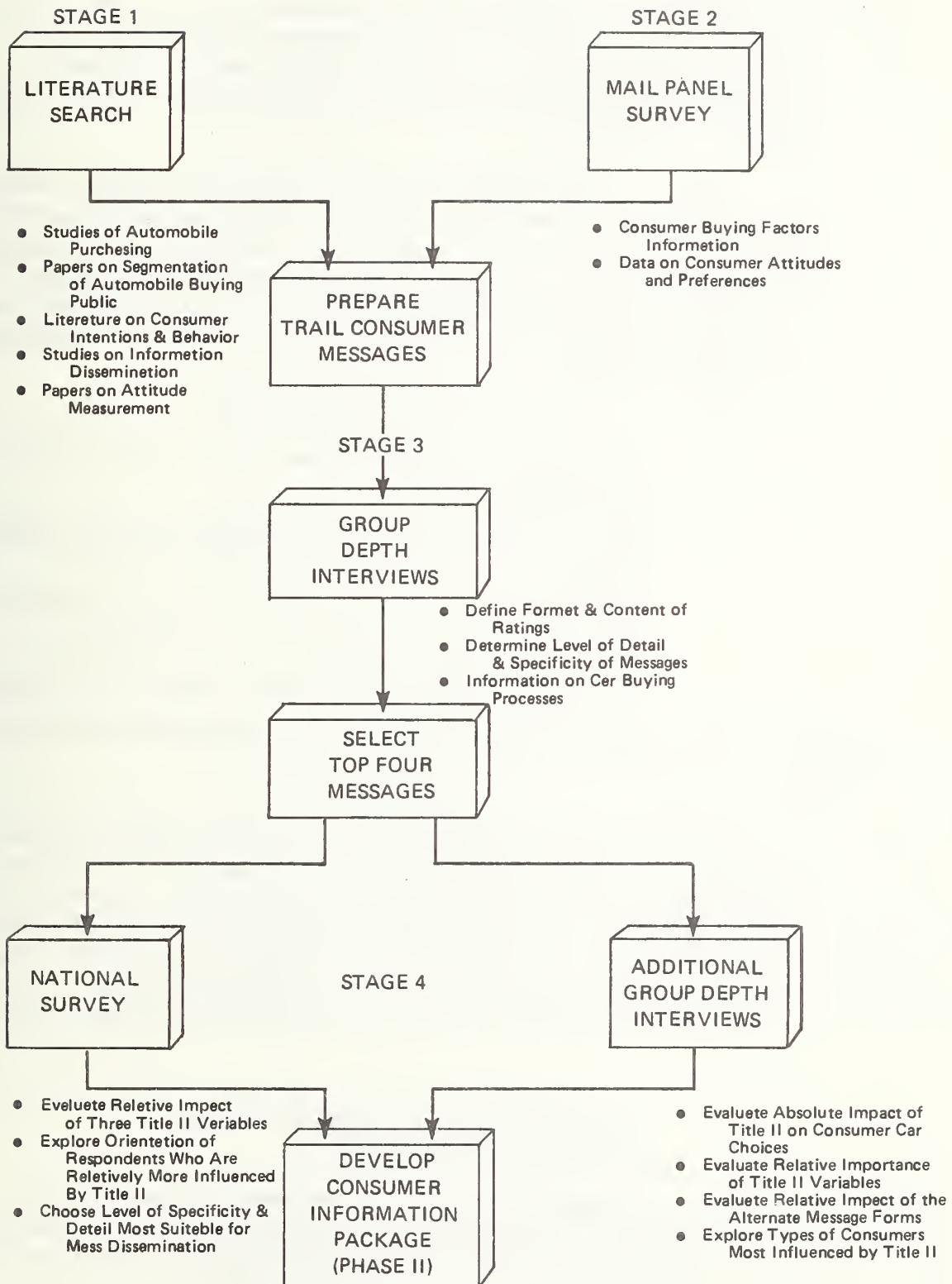
(1) Investigation of Consumer Attitudes and Automobile Buying Behavior

The first two stages of the research plan—the literature survey and the mail panel survey—were used to identify and evaluate the various factors which are important in consumers' decisions to purchase new and used cars. A literature search was conducted during the first three months of the program to survey the existing literature and to gather information on consumer buying behavior, information dissemination and diffusion, and consumers' beliefs toward automobile attributes and consequences of ownership. Leading professional journals, texts and other relevant publications containing information pertinent to the program were reviewed and their content summarized in a formal report. The report served two purposes:

- . It acquainted the reader with the significant literature in the field of consumer behavior, particularly theoretical and methodological developments which have implications for understanding automobile purchase decisions
- . It described the behavioral science concepts and techniques which are applicable in identifying the processes used in forming consumer preferences and judgments, and identified those techniques which would be most useful for the purposes of the Title II study.



FIGURE III-5  
Overview of Information  
Dissemination Study



An important contribution of the literature survey was recognition of the fact that very little detailed demographic and socioeconomic data existed in the public domain related to automobile buying factors and that to obtain such data a survey would be required.

Thus, a mail survey, using a national mail panel, was conducted to provide general background on consumer attitudes toward automobiles and automobile purchasing. While many of the objectives of this research phase were methodological, i.e., to assist in designing materials for group depth interviews and a national personal interview survey, the following information was also obtained:

- . Characteristics consumers value in cars
- . Characteristics that seem to be related to their selection of a car
- . Characteristics associated with particular classes of cars
- . Associates of specific makes and models with favored characteristics
- . Sources of information used in making buying decisions
- . Extent brand loyalty plays in the purchase decision.

The survey was based on a sample of 4,000 members of the National Family Opinion (NFO) mail panel. An expectancy value model was used to analyze the results because of its capability to develop separate belief strength and evaluation scores for every attribute important in the purchase decision. Usable responses were received from 2,652 NFO members. A summary of the most significant results and findings is provided below:

1. Assessment of Two-Stage Theory of Automotive Purchasing

Respondents rated 33 characteristics of cars to show how important each characteristic was in choosing a type of car to buy and in choosing a particular car from

within that type. Respondents rated the characteristic twice in this way because past research, consisting primarily of depth interviewing, suggested that the process of buying a car could validly be represented as consisting of two stages. First a class of car is chosen—compact, intermediate, standard, etc. Second, a specific make/model is selected from within that class. While the two-stage theory has many implications, its potential impact upon importance ratings was considered important for the Title II program since the theory asserts there are two stages in which Title II can have an effect. However, based on the analysis of the responses, it was concluded that the data collected in the survey was not consistent with the two-stage theory. That is, while the theory still holds, the respondents did not reflect in their answers, the kinds of decisions they really make when they buy a car. The results did, however, reflect what attributes consumers feel are important in an automobile. (Later research through group depth interviews demonstrated that the two stage theory had merit.)

## 2. Attribute Ratings

Respondents rated practical attributes of cars, such as dependability, crashworthiness, low cost maintenance, low depreciation, good gas mileage, and low susceptibility to accident damage very high. It was concluded unlikely, however, that all such attributes were really more important in car choice than styling or comfort and that respondents sublimated their actual values and exaggerated their own rationality and attention to practical or utilitarian values. What the ratings did reveal was the respondents view of what should be important in cars. In that context, the results indicated Title II variables are very important.

## 3. Ratings of Car Types

The preceding discussion described the importance of specific attributes in the car buying decision. Respondents also completed two other rating tasks: (1) they rated the extent to which each of the seven types of cars (small subcompact, small compact, small luxury, intermediate, low standard, high standard, luxury standard)

possessed each attribute, and (2) they rated specific make/models they would actually consider buying for possession of the attributes. The following results were obtained for Task 1:

- . Larger cars were believed to be much safer than small cars, even by small car buyers.
- . Small and large car buyers agreed that small cars are less expensive to maintain and repair, and repair after an accident.
- . Even small car buyers tended to agree that large cars are generally superior in such areas as dependability, comfort, quality of finish, etc.

#### 4. Ratings of Individual Make/Models

The results of the second task was based on a comparison of the way respondents rated their specific make/model preferences and their ratings of the car class that included their preferences. Areas where they rated their choice higher than they rated the class as a whole was taken to reveal what especially concerns them about specific make/model choices within a class. The results were as follows:

- . Small car buyers seemed especially concerned with roominess, heavy weight, crashworthiness, and ride quality. In other words, having chosen the small car type, they want a "big" small car.
- . Large car buyers, in the same way, stressed gas mileage, low cost maintenance and repairs, inexpensive accident repair, and low cost.

These findings provided evidence of the existence of the two-stage buying theory. However, respondents here were unable to fully represent their decision-making process through a written response questionnaire.



## 5. Assessment of Brand Loyalty

The results of the survey indicated that brand loyalty (buying the same make over and over) is, in fact, substantial. To the extent that many people choose cars "from habit" can be viewed as a potential obstacle to Title II.

## 6. Analysis of Sources of Information in Car Purchase Selection

Most people were found to rely upon their own personal experience, more than any other sources of information, in buying a car. This may also be another obstacle to Title II.

Cross tabulations of the above information according to demographic and attitudinal characteristics were constructed to help identify segments of the population most likely to be influenced by Title II information. This information in conjunction with information provided by General Electric and NHTSA was used as input by Spiro & Associates to develop seven preliminary consumer messages for use in the next phase of the research, group depth interviews. The format of these messages and the process of refinement is discussed in the next section. For a more detailed discussion of the literature search and consumer buying factors survey the reader is referred to Appendices B and C respectively.

## (2) Development of Alternative Dissemination Forms and Procedures

To explore consumer reaction to Title II type information (i.e., ratings of crashworthiness, damageability, ease of repair and diagnosis, and insurance costs by make/model), the third stage of the plan was implemented. A total of twelve group depth interviews were conducted, four each in Philadelphia, York (Pennsylvania), and Detroit, providing some representation of different parts of the country and major urban and nonurban areas. In each city, two of the groups consisted only of men and two only of women, each representative of some specific



income class (high income — over \$15,000; low income — under \$15,000). All participants were between ages 21 and 55, and all were people whose most recent car purchase was a new rather than a used car.

Each group session lasted approximately two hours and consisted of about eight consumers discussing topics which were presented by a psychologist-moderator. Each group was exposed to the seven alternate trial consumer messages about Title II that had been prepared.

All of the consumer messages were executed on large poster boards and presented information about the crashworthiness, damage susceptibility, and repairability of 19 different makes and models of cars. In the alternate forms of the messages, two items were varied: (1) the headline and copy introducing the Title II ratings; and (2) the way in which the crashworthiness portion of Title II information was presented. Difficulty was anticipated in understanding the meaning of crashworthiness, so several different ways of communicating crashworthiness in a similar message, were prepared as follows:

- . An injury severity index described both numerically (0-100) and using words ("average," "above average," or "below average")
- . The probability of fatality or serious injury
- . A bar chart of injury severity index numbers.

Damage susceptibility and repairability ratings were presented in actual dollar figures. This presentation was not varied due to the expected ease of understanding those concepts. Two examples of the consumer messages that were group tested are displayed in Figures III-6 and III-7 respectively. (You will note the car names have been omitted. This was done as a precaution to protect the car manufacturers from unjust criticism since the ratings are hypothetical. However, in the actual group depth interviews, real car names were used and the respondents were led to believe, until the end of the session, that they were being shown real ratings. Extensive efforts were made by the moderator to assure the participants that the ratings they had been shown had no validity. Each signed a statement acknowledging that he had been so informed).

**FIGURE III-6**  
**Sample of Title II Consumer**  
**Message Presented to**  
**Group Sessions**

**U.S. GOVERNMENT REPORTS TELL YOU:**

**There are three new ways  
to rate 1975 cars.  
Two of them could save you money.  
One of them could save your life.**

MODEL	CRASHWORTHINESS RATING	PROBABILITY OF FATALITY OR SERIOUS INJURY (3)	AVERAGE ACCIDENT REPAIR COSTS 1973-75 MODELS (1)	PREDICTED ACCIDENT REPAIR COSTS 1976 MODELS	AVERAGE MAINTENANCE COSTS 1973-75 MODELS (2)	PREDICTED MAINTENANCE COSTS 1976 MODELS
<b>SMALL CARS</b>						
Above average	75	7.8	\$375	\$275	\$155	\$130
Above average	71	6.7	395	200	170	130
Average	63	8.9	450	325	185	145
Average	59	6.3	500	450	175	170
Below average	46	5.9	530	400	188	175
Below average	31	7.2	500	500	200	210
Below average	29	5.2	(no rating)	475	(no rating)	(no rating)
AVERAGE FOR ALL SMALL CARS TESTED			425	405	180	160
<b>INTERMEDIATE CARS</b>						
Above average	86	3.9	\$300	\$300	\$180	\$160
Above average	83	5.2	325	350	170	170
Average	78	6.2	335	360	175	170
Average	72	4.7	360	360	200	180
Average	63	4.2	400	400	260	200
Below average	54	3.7	450	525	300	250
Below average	51	4.5	460	500	340	260
Below average	49	4.9	(no rating)	380	355	265
AVERAGE FOR ALL INTERMEDIATE CARS TESTED			410	475	290	210
<b>LARGE CARS</b>						
Above average	92	3.4	\$475	\$525	\$400	\$260
Average	90	2.9	550	550	450	300
Average	85	5.1	675	700	500	480
Below average	82	4.6	750	725	560	540
AVERAGE FOR ALL LARGE CARS TESTED			660	680	450	390

(1) Three types of accidents were used in this test. The dollar figure in the chart represents the total cost of all three types of accidents.

(2) This is an annual figure. It represents a combination of both preventive maintenance (oil changes, maintenance required to keep warranty in effect, etc.) and corrective maintenance (spark plugs, fan belts, etc.).

(3) A serious injury is one resulting in two or more days of hospitalization.

These ratings are the results of months of testing by the U.S. Department of Transportation. And if you care about safety and economy, you'd better take a close look at them.

They tell you, in dollars and cents, how much you can expect to pay to repair an accident; how much it'll cost you to maintain each particular model; and how well the different

models protect you in the event of an accident.

Economy and safety are two very important factors to consider before you buy a new car. The government wants you to have the facts, in black and white, to help you make your decision.



U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
WASHINGTON, D.C. 20590

**FIGURE III-7**  
**Sample of Title II Consumer**  
**Message Presented to**  
**Group Sessions**

U.S. Government reports tell you:

# HOW TO FIND OUT WHICH CARS GIVE YOU THE BEST CHANCE OF WALKING AWAY FROM THAT ACCIDENT YOU NEVER THINK YOU'LL HAVE:

If you don't think you can crack up in your car, think again. Because accidents can happen to anyone. Anytime. Any place. And whether or not you're seriously injured can often depend on the model and type of car you're driving.

Crashworthiness is just one of the facts to come out of months of testing and researching by the federal government. This Department of Transportation project also learned how much it costs, by model, to repair accident damage and what yearly operating expenses the

owner of one of these cars can expect to lay out.

You'll find these facts in the tables printed on this page. If you'd like a more complete report on these government findings, you can pick up a copy of the booklet, "Safety, Repairability, and Operating Costs of New Cars" at any Post Office. Or write this address: 1975 Car Ratings, U.S. Government Printing Office, 2750 Illinois Avenue, Washington, D.C. 20215.



U.S. DEPARTMENT OF TRANSPORTATION  
 NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
 WASHINGTON, D.C. 20590

MODEL	CRASHWORTHINESS RATING	PROBABILITY OF FATALITY OR SERIOUS INJURY (1)
SMALL CARS		
	Above average	75 7.8
	Above average	71 6.7
	Average	63 8.9
	Average	59 6.3
	Below average	46 5.9
	Below average	31 7.2
	Below average	29 5.2
INTERMEDIATE CARS		
	Above average	86 3.9
	Above average	83 5.2
	Average	78 6.2
	Average	72 4.7
	Average	63 4.2
	Below average	54 3.7
	Below average	51 4.5
	Below average	49 4.9
LARGE CARS		
	Above average	92 3.4
	Average	90 2.9
	Average	85 5.1
	Below average	82 4.6

1. A serious injury is one resulting in ten or more days of hospitalization.

1. A serious injury is one resulting in ten or more days of hospitalization.

MODEL	AVERAGE ACCIDENT REPAIR COSTS, 1973-75 MODELS (1)	PREDICTED ACCIDENT REPAIR COSTS, 1976 MODELS	AVERAGE MAINTENANCE COSTS, 1973-75 MODELS (2)	PREDICTED MAINTENANCE COSTS, 1976 MODELS
<b>SMALL CARS</b>				
	\$375	\$275	\$155	\$130
	395	200	170	130
	450	325	185	145
	500	450	175	170
	530	400	188	175
	500	500	200	210
	(no rating)	475	(no rating)	(no rating)
AVERAGE FOR ALL SMALL CARS TESTED	425	405	180	160
<b>INTERMEDIATE CARS</b>				
	\$300	\$300	\$180	\$160
	325	350	170	170
	335	360	175	170
	360	360	200	180
	400	400	260	200
	450	525	300	250
	460	500	340	260
	(no rating)	380	355	265
AVERAGE FOR ALL INTERMEDIATE CARS TESTED	410	475	280	210
<b>LARGE CARS</b>				
	\$475	\$525	\$400	\$260
	550	550	450	300
	675	700	500	480
	750	725	560	540
AVERAGE FOR ALL LARGE CARS TESTED	660	680	450	390

(1) Three types of accidents were used in this test. The dollar figure in the chart represents the total cost of all three types of accidents.  
(2) This is an annual figure. It represents a combination of both preventive maintenance (oil changes, maintenance required to keep warranty in effect) etc. and corrective maintenance (spark plugs, fan belts, etc.).



The primary purpose of the group depth interviews was to screen and refine the messages for use in a national survey and supplementary group depth interviews. However, during free flowing group discussion and the subtle probing by the moderator, information on consumer attitudes, car buying processes and appeals for certain types of information was also obtained. Significant findings obtained from the groups are summarized below:

1. Consumer Reaction to the Prospect of Ratings

Participant interest in the government's presenting Title II information tended to be significant although far from universal. In York and Detroit especially, many participants questioned the appropriateness and value of the government's developing the ratings while the response from the Philadelphia groups was much more positive. This geographic difference could have well been due to chance (since the groups were small) or it could have reflected an ideological opposition to government activities that impact on private industry in the case of York, and a sense of identification with the automotive industry against its government "opponents" in the case of Detroit. At any rate, it was found that a significant number of people did support the government publication of Title II ratings. (This issue is being examined in detail during the ongoing national survey and group depth interviews.)

2. Consumer Reaction to Utility of Ratings

Participant reaction was split as to whether Title II information would be used but a significant number indicated they would use it. Not surprisingly, the participants made it clear that their interest in the ratings would be highest at the time they were about to buy a car. In fact, some of them objected that display of the ratings in newspapers and general media would be "wasteful" since most readers would not be car shopping at the time they saw the ratings, and would hardly remember them months or years later. As a result, many participants favored dissemination via a booklet which they could obtain when they were ready for it.

### 3. Assessment of Two-Stage Theory of Automobile Purchasing

The "two-stage decision" theory, i. e., that people first choose a class of automobiles to purchase from and second, select a particular make/model from within that class, was supported by the group depth interviews. In fact, a few participants were quite explicit about it as evidenced by the following quotes:

"First you get an idea, then you look."

"There was a basic period in which I narrowed it down to a class."

This two-stage theory has obvious implications for successfully accomplishing the Title II program, since there appears to be two types of decisions upon which the Title II information can have an impact. The results of the group depth interviews provided a considerable amount of support for the two-stage theory of car buying which was not fully supported by the results of the mail panel survey.

### 4. Importance of Accident Repair Cost Ratings

One of the most conclusive findings from the group depth interviews was the low level of interest in accident repair costs. Accident repair costs were found to be of little, if any, importance to participants in purchasing an automobile. There were two reasons for this lack of interest. First, most consumers were quick to recognize that accident repair costs may be of interest to insurance companies but have no direct impact on the consumers pocketbook. Second, in order to weigh accident repair costs in making a decision, the consumer must accept fully the possibility that he will have an accident. Many people prefer not to think about that possibility. However, once the consumer has brought himself to the point of considering that he might have an accident, human safety overrides concern about vehicle damage.



## 5. Importance of Safety and Maintenance Cost Ratings

Most participants were quick to assert that safety should be a major consideration when buying a car and most participants put maintenance costs secondary to safety. However, it was found that some consumers perceived maintenance cost differences where they did not perceive safety differences. Therefore, it was concluded that maintenance costs may influence at least as many current car purchases as safety considerations.

In addition to the above findings, the group depth interviews also achieved their primary goal of providing insights for the process of refining the format and content of the messages and helping define the level of detail and specificity which the ratings themselves should provide. For example, it was found that consumer interest in how the ratings were developed, varied from intense to indifference. Based on the results of the group interviews, the top four candidates were chosen from the seven preliminary consumer messages for further refinement and use in the national survey of households and additional group depth interviews. This step of the research plan is currently underway and is described in detail in Appendix E. Further detail on the conduct of the group depth interviews is included in Appendix D.

## (3) Program Support Activities

In addition to developing a method for communicating Title II to the public, Booz, Allen was also responsible for conducting several related tasks and program support activities. Specific activities conducted during Phase I are summarized below:

### 1. Conduct of Vehicle Owners Maintenance Survey

To support the development of a vehicle rating system for repairability, a vehicle owners maintenance survey was conducted to collect maintenance and operational repair data directly from a selected group of

knowledgeable vehicle owners. The purpose of the survey was twofold: (1) to provide additional data on auto maintenance and repair for use in the rating system development and (2) to identify repair problems not uncovered in other data sources.

The approach to the survey was based on the thesis that one should not seek a representative sample of automobile owners to gather reliable auto repair data. Rather the survey isolated the knowledgeable owner who keeps good records and induced him to cooperate. Participants (25,000) were meticulously selected from a national technical society to insure only those individuals most likely to maintain good auto repair records were included in the survey. Two mailings were conducted and an offer to supply the respondents with the tabulated results of the survey was made as an inducement to respond. Ten thousand respondents were received and 1968 responses covering high volume 1973-1975 cars were coded. The tabulated results of the survey are provided in Appendix A.

2. Conduct of Owner Records Survey for Automobile Crashworthiness and Damage Susceptibility

In addition to the vehicle owner survey for repairability, a survey was conducted under subcontract to Calspan Corporation to collect medical and crash damage repair cost data to support the development of vehicle ratings for crashworthiness and damage susceptibility. The approach employed in the survey was a modification of work being performed by Calspan under the tri-level accident investigation program sponsored by the National Highway Traffic Safety Administration. Data was collected in an eight county area of western New York and included all 1973-1975 "high volume" model automobiles. A summary of the data collected is as follows:

- . Vehicle. All relevant information contained in vehicle registration files including make/model, model year, and vehicle identification number.
- . Accident. All relevant data contained on the driver and police accident reports filed with

the New York State Department of Motor Vehicles including accident site, vehicle or objects involved.

- . Crash damage repair cost. Detailed repair cost estimates including cost of parts and labor. In cases where the vehicle was a total loss, the market value or salvage value of the car was given.
- . Medical. Medical data on all injured persons including what specific portions of the occupant's body contacted various components and the associated injury.

### 3. Coordination and Assessment of Contractor Efforts

Program support was provided during Phase I to assist NHTSA coordinate and assess the results of the entire Title II program. This task involved the following activities:

- . Maintaining current files of all Title II program data as reported at the monthly meetings, so that these data would be readily available for incorporation into progress reports, briefings, and program documentation
- . Maintaining a master program schedule for the entire Title II program, to provide the overview necessary to effectively perform the integration function
- . Monitoring the other contract efforts from the perspective of the consumer, to assure that the data being developed was that data which the consumer surveys show to be most meaningful
- . Monitoring the Title II program efforts for data and information useful on this program.

These activities will be continued during Phase II.

#### 4. SOCIOECONOMIC IMPACT STUDY

Early in its planning for executing the study mandated by Title II, the need was recognized to investigate the full range of potential beneficial and adverse consequences of Title II information dissemination on various affected groups. The findings of such an investigation were to help guide the primary Title II effort to develop and communicate the ratings so as to anticipate and avoid any undesirable consequences of implementation.

Two different study approaches were selected to achieve the above objectives. Study contracts were awarded as follows:

- . Estimates of the socioeconomic impact of Title II implementation from expert opinion (Arthur D. Little)
- . Estimates of the socioeconomic impact of Title II implementation from mathematical modeling (Center for the Environment and Man).

(1) Estimates of the Socioeconomic Impact of Implementing Title II from Expert Opinion

This study was based upon soliciting the informed judgments and opinions of a group of experts to provide a preliminary assessment of the effects of Title II ratings on automobile dealers, purchasers and manufacturers during the first year after dissemination. Two panels of experts were assembled, one consisting of experts in automobile marketing and the other of new car dealers. A third panel consisting of representatives from major U. S. automobile manufacturers was planned but was eliminated since only one of the manufacturers agreed to participate.

The basic task of the panels was to estimate changes in the market shares of different makes and models that would be brought about by the publication of vehicle rating information. Each panel was provided with scenarios that discussed ways in which Title II might realistically be implemented, and asked to



estimate the probable effects of Title II in the groups they represented, and their probable reaction to the program. The Delphi method was used to refine the estimates provided by the panelists through a series of three rounds of questionnaires. The process is shown in Figure III-8. Based on the responses provided by the marketers in the third round, estimates were made on the impact Title II would have during the first year of implementation on consumer payments for new automobiles, gasoline and raw materials consumption, injury/fatality reduction and repair part prices. Broad sociopolitical consequences and the impact of Title II on the insurance industry were also examined based primarily on personal interviews with key individuals in each of these areas. Major conclusions drawn from the study as reflected by the opinions of the Delphi panel members are as follows:

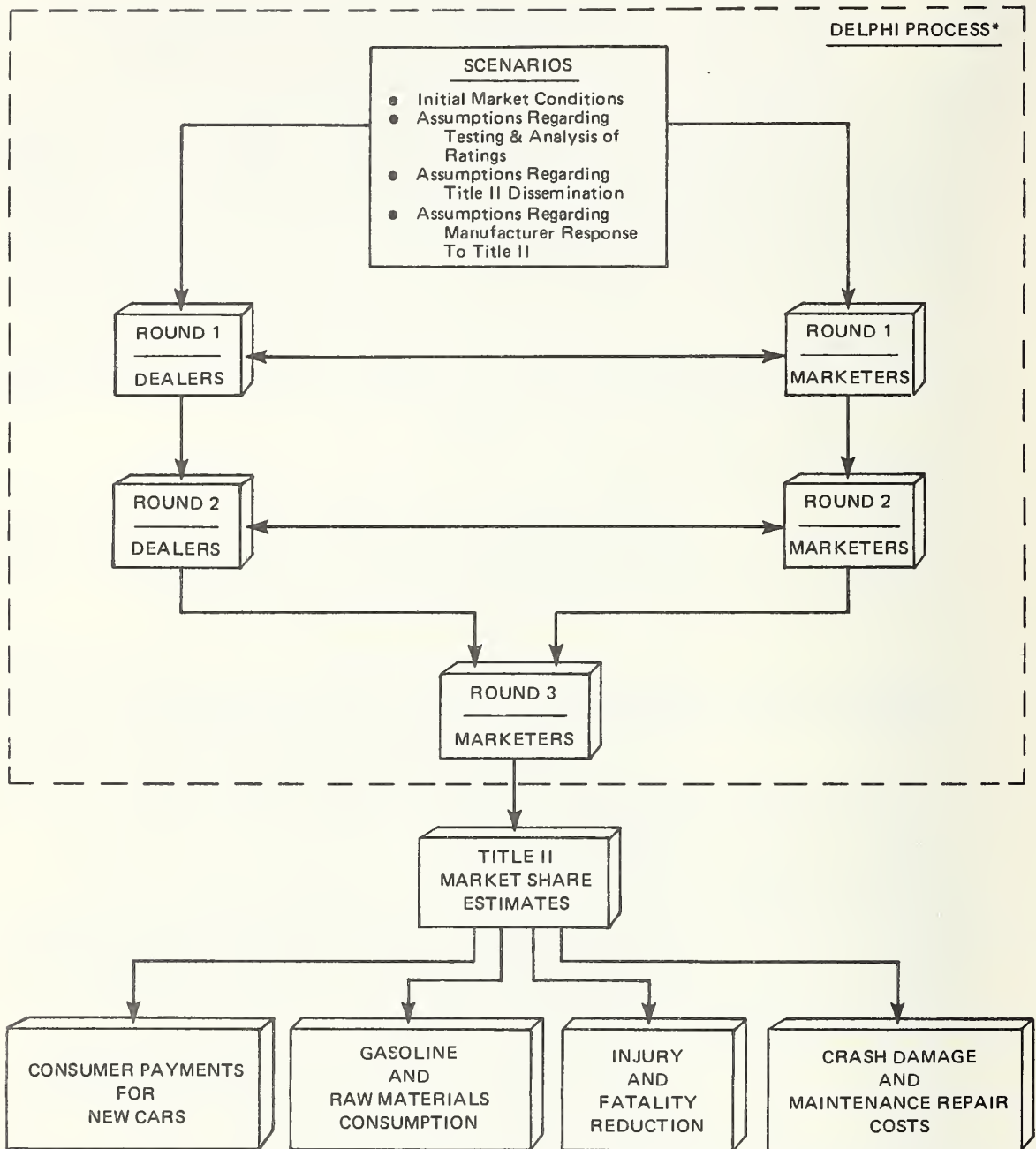
- . Implementation of Title II is not likely to have significant affect on the public in its first year of implementation because of the small coverage and the limited possibility of reaction to Title II.
- . The impact may be expected to be much higher in ten years if Title II is continuously implemented over that time; in ten years a much larger proportion of the cars on the road will have been bought by consumers exposed to the influence of Title II and the primary effects of Title II will have been much greater.
- . Damage susceptibility is expected to be the least important rating because consumers will assume their insurance will cover damage expenses above the deductible amount.
- . Crashworthiness is expected to have the most significant impact on automobile buying behavior.

(2) Estimates of the Socioeconomic Impact of Implementing Title II From Mathematical Modeling

In contrast to the approach employed in the previous study, this study was based on the use of three mathematical models (see Figure III-9) for estimating Title II induced effects:

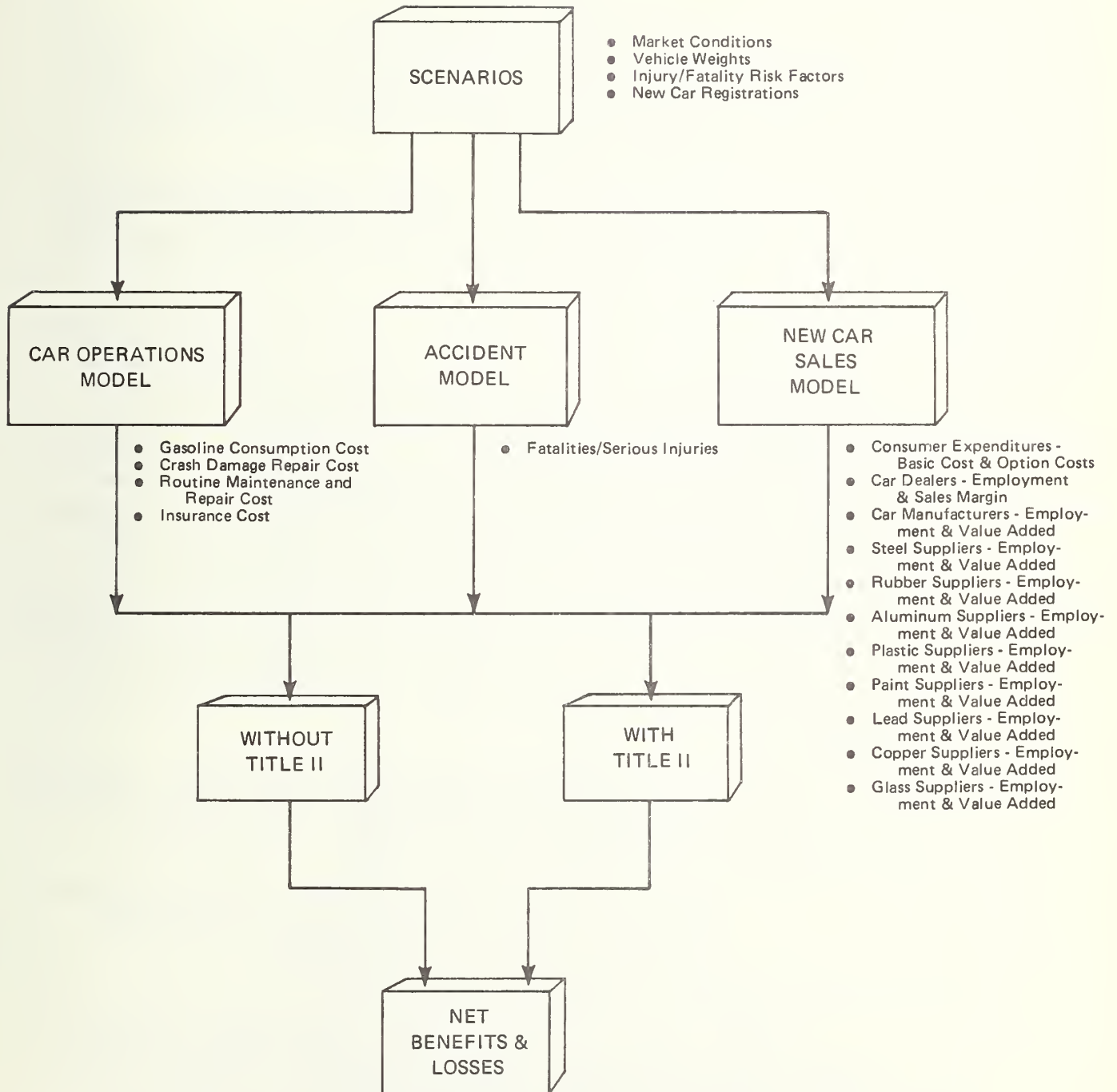


FIGURE III-8  
Overview of ADL Socioeconomic  
Impact Methodology



\*DELPHI IS BASICALLY AN ITERATIVE PROCEDURE FOR ELICITING AND REFINING THE OPINIONS OF A GROUP OF EXPERTS BY MEANS OF A SERIES OF ANONYMOUS QUESTIONNAIRES. IT IS APPROPRIATE IN SITUATIONS WITH A HIGH SOCIAL AND POLITICAL CONTENT WHERE DATA IS LIMITED OR CANNOT BE GATHERED. THE IDEA OF THE DELPHI IS TO IMPROVE THE PANEL OR COMMITTEE APPROACH IN ARRIVING AT A FORECAST OR ESTIMATE BY SUBJECTING THE VIEWS OF INDIVIDUAL PARTICIPANTS TO EACH OTHERS CRITICISM IN WAYS THAT AVOID FACE TO FACE CONFRONTATION. IN THIS WAY, THE PROCESS OF DELIBERATION IS CONTROLLED AND HOPEFULLY OVERCOMES THE PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF JUDGMENTS IN COMMITTEE MEETINGS OR GROUP DISCUSSIONS.

FIGURE III-9  
Overview of CEM's Mathematical  
Modeling Approach to Benefits  
Estimation



- . An accident model to compare the number of fatalities and serious injuries under assumed car buying conditions with and without the availability of Title II information.
- . A new car sales model to determine the impact of Title II on 22 societal elements involving consumer expenditures and employment, sales margin, and value added for dealers, car manufacturers, and industrial suppliers.
- . A car operations cost model to determine the impact of Title II on total gasoline consumption cost, crash damage repair cost, routine maintenance and repair cost, and insurance cost.

To obtain the desired predictions, data describing possible sets of market conditions (scenarios) based on projections of car buying behavior over the 10-year period 1976-1985 were fed into the models. Included in the scenarios were market shares for different make/models, vehicle weights, and injury/fatality risk factors represented as either dependent or independent variables. Estimates of new car registrations through 1985 as prepared by the Department of Commerce were also included in the scenarios but were treated as constant. The output of the models was an indication of Title II impact presented in the form of 10-year average values of the percentage difference between results under "with Title II" and "without Title II" information. Major conclusions drawn from the study are as follows:

- . No individual elements will be significantly influenced by small market share shifts (ten percent or less) due to the availability of Title II information.
- . Fatal or serious injuries incurred by car occupants in crashes will most significantly be reduced by improvements in crashworthiness.

In summary, the results of this study indicate that Title II is not likely to have significant impact on the public or industry unless significant market shifts are induced. A major goal of Phase II will be to further investigate the consequences of Title II in the public domain based on a national interview survey of households and additional group depth interviews.

#### IV. PHASE II PROGRAM PLANS

This chapter briefly describes near-term research activities planned for Title II. As discussed in Chapter II, NHTSA has developed and is implementing a two-phase feasibility study for conducting the Title II program. Phase I was directed at developing a preliminary methodology for rating automobiles according to the characteristics of damage susceptibility, crashworthiness, and ease of diagnosis and repair, and at investigating various ways of communicating that information to the public. Phase I is complete. Phase II calls for refinement of the Phase I methodology and application to high volume car models in a single market class. Specific program activities planned for Phase II are summarized below.

- . Update and refine Phase I vehicle rating system methodologies. The initial vehicle rating systems developed during Phase I will be improved in Phase II. Data from additional sources will be analyzed and adjustments made to account for the effects of driver and environmental characteristics inherent in the use of field data. Data on exposure to accidents and component failures will also be collected, analyzed and incorporated into the vehicle rating system methodologies. Other activities planned will include:
  - Analysis of the mathematical models used in the predictive rating systems for damage susceptibility and crashworthiness in terms of the sensitivity of model outputs to varying input parameters and the capability of the models to accurately predict vehicle and occupant response to varying crash conditions
  - Collection of manufacturer design data on the four intermediates—Chevelle, Matador, Torino and Satellite
  - Preparation of historical vehicle ratings for which sufficient data is available and predictive ratings if modeling techniques are perfected.



- . Conduct crash/component test program. Supplementing the rating system effort will be crash and component test data on the four 1974 intermediates. Crash tests will be conducted at 8, 25, 30, and 35 mph to produce a broader array of accident situations, and component tests will be conducted that include:

- Bumper/barrier (front and rear)
- Frame and sheet metal/bumper (front and rear)
- Rear frame/body
- Radiator and air conditioner/engine
- Engine/firewall and drive train
- Engine mounts

- . Develop preliminary consumer information package. If automobile ratings are developed during Phase II, a preliminary consumer information package will be developed that communicates to the public in a simple and readily understandable manner information on the crash-worthiness, damage susceptibility, and repairability of particular make/models. The package will be conservative in design and will include ratings for only high volume late model year cars in one market class.

- . Develop preliminary dissemination plan. Concurrently with the above effort, a preliminary plan for disseminating the information to the public will also be developed. The plan will be based on the results of the national survey and group depth interviews and will include:

- A schedule for disseminating the materials
- The selection of a demographic market
- The selection of a geographic market

Media alternatives to be considered will include radio, television, and newspaper advertising.

Dissemination of the ratings is tentatively scheduled for January 1976 following a DOT management review in the fall of 1975. If a decision is made to disseminate, final ratings for selected car models will be integrated with the development of a final consumer information package and dissemination plan in October and November 1975. Following the dissemination, an impact survey will be conducted to assess the impact of Title II and to recommend improvements to the package.



## APPENDIX A

### OWNER SURVEY FOR REPAIRABILITY

As part of the Title II study plan, a vehicle owner's maintenance survey was conducted by Booz, Allen to collect maintenance and operational repair data directly from a selected group of knowledgeable vehicle owners. This appendix summarizes the conduct and results of that survey under the following headings:

- . Survey objectives
- . Description of survey plan
- . Data processing and tabulation of results.

#### 1. SURVEY OBJECTIVES

The purpose of the survey was twofold: (1) to provide additional data input to the repairability rating system development effort, and (2) to identify repair problems not uncovered in other data sources that automobile owners often experience. Booz, Allen devised an approach to this problem that involved the collection of data directly from a select group of individuals most likely to maintain good auto repair records. This approach is outlined in the next section.

#### 2. DESCRIPTION OF SURVEY PLAN

The approach to the survey was based on the thesis that one should not seek a representative sample of automobile owners to gather reliable auto repair data. The survey approach should isolate the knowledgeable owner who keeps good records and induce him to cooperate. Based on this hypothesis, a national technical society was solicited to participate in the survey. A sample size of 25,000 (57 percent of the membership) was chosen from their membership list, selecting those members felt to be most likely to maintain good maintenance records.

Two mailings were conducted and an offer to supply the respondent with the tabulated results of the survey was made as the only inducement to respond. Both mailings included a cover letter stating the objective of the survey, a copy of the questionnaire and a self-addressed envelope for the respondents' convenience in returning the

questionnaire. A copy of the questionnaire and the two cover letters used in the mailings are displayed in Figures A-2 through A-4 attached to this appendix.

### 3. DATA PROCESSING AND TABULATION OF RESULTS

The response to the survey was excellent. Approximately 10,000 responses were received marking a very high 40 percent response rate. A 10 percent response is typical for mailed, self-administered questionnaire surveys.

Those makes/models that are expected to be rated in the first few years of the program were included in the data base. Coding guidelines were set up (see Exhibit A-1) and only those forms complying with the guidelines were coded for computer analysis. A detailed coding scheme that included codes for make/model, model year, purchase mileage, current mileage, mileage at the time the maintenance operation was performed, and respondent comments, was used to tabulate data from the forms. Figure A-1 contains a complete list of all the information that was coded. For brevity, the codes themselves have not been included.

The coded forms were then transferred to IBM computer cards. The data was keypunched directly from the coded questionnaires and subjected to 100 percent verification. All inconsistencies were flagged and repunched.

The punched cards served as the records of owner repair operations suitable for ADP. A computer program was developed to summarize the data contained in the questionnaire both for transmittal to General Electric for use in the development of ratings and to satisfy the commitment made to return the results of the survey to those requesting it.

Tables A-1 through A-3 present the results of the survey and Figure A-5 presents a copy of the cover letter returned to respondents. The tables represent a summary of the data and are not a rating for repairability. General Electric is analyzing this data for use with information from numerous other sources such as garage repair records and fleet maintenance data to develop a rating system for automobile repairability.

## APPENDIX A(3)

### EXHIBIT A-1 Coding Guidelines

The following guidelines were used in the selection of survey forms to be coded:

- (1) Code all selected intermediate size cars from 1969 model year to date.
- (2) Code all make/models likely to be rated in the first few years of the program\* that possessed the following characteristics:
  - . Purchased New
    - 1969 model year to date
    - Two or more corrective maintenance entries based on actual repair records
    - 12,000+ miles
  - . Purchased Used
    - 1969 model year to date
    - Two or more corrective maintenance entries based on actual repair records.

---

\* Based on a list of make/models prepared by NHTSA December 31, 1974.

FIGURE A-1  
List of Information Coded  
From SAE Survey

Automobile Make/Model

Body Style

Model Year

Purchase Date

Purchase Mileage

Current Mileage

Purchase Condition (New or Used)

Optional Equipment:

- Air Conditioning
- Power Steering
- Power Brakes
- Disc Brakes
- Automatic Transmission

Engine Characteristics

- Number of Cylinders
- Cubic Inches

Annual Mileage Driven

City/State

Component Failure/Replacement

- Mileage at Time of Replacement
- Mileage at Time of Previous Replacement
- Type of Maintenance (Preventive, Corrective)

Owner Comments

- Regarding Accessibility of Components
- Regarding Reliability of Components
- Miscellaneous comments

FIGURE A-2  
Cover Letter Accompanying First  
Mailing of Questionnaires

BOOZ · ALLEN & HAMILTON Inc.

*Management Consultants*

NEW YORK WASHINGTON CLEVELAND DETROIT  
CHICAGO DALLAS LOS ANGELES SAN FRANCISCO  
TORONTO MEXICO CITY RIO DE JANEIRO  
LONDON DUSSELDORF

4733 BETHESDA AVENUE  
BETHESDA, MARYLAND 20014  
656-2200  
AREA CODE 301

October 21, 1974

Dear SAE Member:

Booz, Allen & Hamilton Inc., under contract to the U.S. Department of Transportation, National Highway Traffic Safety Administration, is conducting a survey of knowledgeable automobile owners to gather firsthand information about the kinds of repairs necessary to maintain their vehicles. The results of this survey will be used to help develop a rating system that compares the repairability of automobiles sold in the United States.

In the past, surveys of this type such as those conducted by Consumers Union have been criticized because the people who filled out the forms were not very knowledgeable about automobiles.

You have been selected to receive this questionnaire because you represent the knowledgeable automobile owner. By asking the following questions of "experts" such as yourself, we hope to overcome this past criticism and to obtain answers to those questions which will be truly useful to the knowledgeable automobile buyer. We would appreciate it if you would complete this questionnaire and return it as soon as possible in the enclosed postage-paid envelope.

The information you provide will be coded so that you will remain anonymous. Your individual responses will be kept entirely confidential and will not be reported under any circumstances. If you are interested, we will supply you with a copy of the results of this survey which may be useful to you in making your next automobile purchase decision. Simply complete and address label you will find at the close of the questionnaire and the results will be mailed to you. The label will be removed from the questionnaire and used for mailing only, and will not identify you with a particular form.

Thank you very much for your time and cooperation.

Very truly yours,



BOOZ · ALLEN & HAMILTON Inc.

David W. Weiss  
Vice President

Encl.



FIGURE A-3  
Cover Letter Accompanying Second  
Mailing of Questionnaires

BOOZ · ALLEN & HAMILTON Inc.

*Management Consultants*

NEW YORK WASHINGTON CLEVELAND DETROIT  
CHICAGO DALLAS LOS ANGELES SAN FRANCISCO  
TORONTO MEXICO CITY RIO DE JANEIRO  
LONDON GUSSEFLOOF

4733 BETHESDA AVENUE  
BETHESDA, MARYLAND 20014  
656-2200  
AREA CODE 301

November 11, 1974

Dear SAE Member:

Approximately three weeks ago you received a copy of a questionnaire regarding repairs on your newest automobile.


You were specifically chosen from a list of all SAE members, because we felt that your background demonstrated a high degree of competence in the automotive design and service areas. Since the number of SAE members chosen for this special panel is limited, we are particularly dependent upon your response to improve the credibility of our results.

We have not yet received your response. We know that someone in your position is very busy and that answering our questionnaire may be somewhat time consuming. If you haven't done so already, please fill in the attached questionnaire and return it to us in the enclosed envelope. If you have already completed the questionnaire and mailed it to us, thank you very much for your help.

Your response will remain anonymous, but if you would like a copy of the results of this special panel, please fill out the mailing label at the end of the questionnaire. This label will be used to mail the results to you as soon as we complete the tabulation. We expect that the results will be interesting and may be of personal use to you.

Thank you again for your time.

Very truly yours



BOOZ · ALLEN & HAMILTON Inc.

David W. Weiss  
Vice President

FIGURE A-4  
Automobile Maintenance  
Questionnaire

Form Approved  
OMB Approval No. 004S74047  
Approval Expires, February, 1975

U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
AUTOMOBILE MAINTENANCE QUESTIONNAIRE

If you maintain maintenance and repair records, please use them to aid you in filling out this questionnaire. If you do not, please answer the questions as completely as possible.

1.(a) For the latest model car you own, please provide the following information:

Make/Model (i.e., Ford Torino, Dodge Dart, etc.)	_____
Body Style (i.e., 2-door hardtop, station wagon, etc.)	_____
Model Year	_____
Approximate Date of Purchase (month, year)	_____
Approximate Mileage When Purchased	_____
Current Mileage	_____

(b) For the car identified above, please check the appropriate box to indicate the car's equipment:

	YES	NO	
Air conditioning	<input type="checkbox"/>	<input type="checkbox"/>	Engine (include size in cubic inches):
Power steering	<input type="checkbox"/>	<input type="checkbox"/>	
Power brakes	<input type="checkbox"/>	<input type="checkbox"/>	8 cylinder <input type="checkbox"/>
Disc brakes	<input type="checkbox"/>	<input type="checkbox"/>	6 cylinder <input type="checkbox"/>
Automatic Transmission	<input type="checkbox"/>	<input type="checkbox"/>	4 cylinder <input type="checkbox"/>

Additional special features (i.e., transistor ignition, speed control, etc.)

Please answer the following questions in relation only to the car identified in Question 1.

2. Approximately how many miles is the car driven annually? \_\_\_\_\_
3. In what city and state or metropolitan area is the car driven most often? \_\_\_\_\_

FIGURE A-4

Continued

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Valves, Tappets, Push Rods, and Rocker Arms (please comment)							
Oil Change							
Oil Filters							
Chassis Lubrication							
Carburetor							
Automatic Choke and Vacuum Control Assembly							
Fuel Pump							
Fuel Filter							
Timing System Equipment (include adjust timing and repair, or replace timing gears, chains, or camshaft work—please comment)							

APPENDIX A(9).  
FIGURE A-4  
Continued

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Water Pump							
Belts (fan/pump/ compressor)							
Thermostat							
Radiator System (hoses and connections)							
PCV Valve							
Air Cleaner (note cleaned air cleaner under "repair")							
Muffler/Resonator							
Tail Pipes (if tail pipe re- placed with muffler, check the "replace" column both under muffler/resonator and tail pipe)							
Engine Exhaust Pipe							



FIGURE A-4

Continued

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Voltage Regulator							
Heater System (hoses, clamps, controls, core—please comment)							
Generator or Alternator (please comment)							
Starter							
Starter Solenoid							
Distributor Assembly Equipment (shaft and cam assembly, rotor, cup, total distributor, or vacuum control unit—please comment)							
Bulbs/Sockets— Headlights (1 or more, comment) Tail/Stoplights (1 or more, comment) Turn signal—include flasher (1 or more, comment)							
A/C or Heater Blower Motor							
Air Conditioner Compressor and Associated Equipment (please comment)							

FIGURE A-4

Continued

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Automatic Transmission (note linkage adjustment under "adjust"; overhaul under "repair")							
Bearings - rear wheel							
Rear Axle Seals and Retainers							
Brake Lining Front (if not both, please comment)							
Brake Lining Rear (if not both, please comment)							
Master Cylinder							
Wheel Cylinder (1 or more, please comment)							
Parking Brake System							
Power Brake Equipment							

APPENDIX A(12)  
FIGURE A-4  
Continued

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Front End Alignments							
Tires—Front							
Tires—Rear							
Universal Joints							
Points and Condenser							
Spark Plugs - Sets (if not, please comment)							
Ignition Coil							
Spark Plug Wires							
Battery							

FIGURE A-4

Continued

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Brake Lines and Hoses							
Front Shocks (if not both, please comment)							
Rear Shocks (if not both, please comment)							
Tie Rod Ends (1 or more, please comment)							
Idler Arm							
Steering Gear or Power Steering Hoses (please comment)							
Ball Joints (1 or more, please comment)							
Wheel Bearings - Front (1 or more, please comment)							
Wheel Balance (check "adjust" column—if 1 or more, please comment)							

## FIGURE A-4

## Continued

4. The following list of automotive parts are commonly involved in performing both preventive and corrective maintenance operations on your automobile. For each part, please specify the number of times an operation was performed on your car since you purchased it, that entailed the adjustment, repair or replacement of the part identified. Also indicate the approximate mileage on the car each time the operation was accomplished. Inspection of your car requiring no maintenance should not be reported. Please consult your actual repair and maintenance records to obtain the information required to complete the table. If these are not available but you have a good idea of the information requested, please rely on your memory to fill out the table. If you remember that maintenance was performed on your car involving the part identified, but have no recollection of the additional information requested, please note this in the comments section. To aid you in responding to this question, the following example is provided.

Example:

Suppose you repaired a faulty rear wheel cylinder at 10,000 miles, replaced one front wheel cylinder as part of a brake job at 22,000 miles and replaced the other front wheel cylinder while adjusting your brakes at 27,000 miles. This would be reported as follows:

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Wheel cylinder (1 or more—please comment)		1	2		10,000	22,000 27,000	Repaired faulty left rear wheel cylinder at 10,000 miles, replaced right front wheel cylinder as part of a brake job at 22,000 miles and replaced left front wheel cylinder while adjusting brakes at 27,000 miles

The same format should be followed in completing the table where there is one or more of the same part on the car (i.e., shock absorbers, wheel cylinders, ball joints, etc.).



FIGURE A - 4  
Continued

PREVENTIVE AND CORRECTIVE MAINTENANCE OPERATIONS							
Part Name	Nature and Number of Times Operation Performed			Approximate Mileage At Time of Operation			Comments
	Adjust	Repair	Replace	Adjust	Repair	Replace	
Air Conditioner Evaporator Expansion Valve							
Windshield Wipers (arms and blades—please comment)							
Windshield Wipers (motor and controls—please comment)							

5. Below is a table labeled "Major Repair Operations". Please indicate in the space provided all major repair operations that have been accomplished on your automobile since you purchased it, the number of times (frequency) this operation was performed, and the approximate mileage at the time of each operation. Do not include on your list any major repairs executed as a result of a motor vehicle accident, and please comment on specific details of each operation. (Note: By major repair operations, we mean engine overhaul, piston rings, cylinder block recondition, rod bearings, main bearings, differential overhaul, etc.).

MAJOR REPAIR OPERATIONS			
Major Repair Operation	Frequency of Repair Operation	Approximate Mileage at Time of Repair	Comments

APPENDIX A(16)  
FIGURE A-4  
Continued

6. What was the source of information you consulted to supply the data you reported in this survey?

Actual repair and maintenance records \_\_\_\_\_

Memory \_\_\_\_\_

Other (please specify) \_\_\_\_\_

7. The following space is provided for any additional comments you may care to make regarding the maintenance of your automobile. Please feel free to comment on any particular problems you have encountered, or any problems specifically pointed out to you by the people who serviced your car, which caused excessive repair time and labor costs. List for example the inaccessibility of certain components, the need to remove components in good working order to get at failed components, components which are difficult to adjust properly, components whose failure is difficult to diagnose, and other annoying failures not elsewhere mentioned (e.g., misaligned windows and doors, malfunctioning gauges, etc.). Be specific and as detailed as possible so that we can test these problems out ourselves, as appropriate. Please use additional paper if necessary.

If you wish to receive a return copy of the results of this study, please fill in the address label below. Remember the label will only be used to facilitate mailing of the results to you and will not in any way infringe upon your confidentiality. THANK YOU.

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

# FIGURE A-5

## Cover Letter Accompanying Mailing of Survey Results

BOOZ - ALLEN &amp; HAMILTON Inc.

*Booz Allen Applied Research Division*

NEW YORK NEWARK WASHINGTON JERSEY CITY  
PHILADELPHIA PITTSBURGH RICHMOND  
ST. LOUIS ST. PAUL TAMPA  
WASHINGTON METRO AREA  
CHICAGO CLEVELAND

4715 LEE HIGH AVENUE  
BETHESDA, MARYLAND 20014  
696 2000  
AREA CODE 301

April 23, 1975

Dear Member of the Survey Panel:

I would like to take this opportunity to thank you for participating in our survey of automobile owners. Your participation has been valuable to us in achieving our study objectives. We have received numerous letters from members of the survey panel describing ideas about repairability improvements and also requesting clarification of the purpose of the survey and details on the measures taken to preserve the confidentiality of the data collected.

As stated in our original cover letter attached to the questionnaire, the National Highway Traffic Safety Administration, U.S. Department of Transportation is the government agency responsible for this program. As required by Public Law 92-513, they are conducting a comprehensive consumer information study to determine the feasibility of comparing crashworthiness, damage susceptibility, ease of repair, and relative insurance costs by automobile make and model. A report of the results of this study will be made public before the end of 1975.

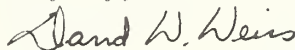
This survey of automobile owners is only a small part of that overall program. The information gathered in this special survey of knowledgeable owners will be used together with information from numerous other sources such as garage repair records and fleet maintenance data to develop a rating system for automobile repairability.

The survey forms used for this special survey were computer coded upon receipt. A special system was set up to code the handwritten comments and the standard data recorded in the tables on frequency of repair of various components. The address label attached to the form was used only to facilitate mailing of the results to you. The second questionnaire you received was preprogrammed to stimulate response to our survey. We had no way of knowing whether or not you had responded since all replies were kept anonymous.

The findings of this survey have been tabulated and are enclosed. The tables represent a summary of the data, and are not a rating for repairability. The tables should not be construed as a consumer rating scale for automobiles. Some makes and models were omitted from the tables because of program constraints and/or because of limited data availability. Make/model comparisons cannot be made from this data.

We realize the limited utility of the data as presented in this tabular format, and are keenly sensitive to the implications of publishing statistically invalid comparisons. Research is currently underway by NHTSA to develop valid comparisons among makes and models with respect to overall maintenance requirements.

Very truly yours,



BOOZ-ALLEN &amp; HAMILTON Inc.

David W. Weiss  
Vice President

Table A-1

SAE Survey Results: Number of Vehicles, Total Number of Miles  
and Average Number of Miles by Make/Series

MAKE/SERIES	NUMBER OF VEHICLES	TOTAL MILES (000's)	AVERAGE MILES (000's)
<b><u>AMERICAN MOTORS CORP.</u></b>			
HORNET	20	617	30
MATADOR	34	792	23
TOTAL - AMC	54	1,409	26
<b><u>CHRYSLER CORP.</u></b>			
SATELLITE	79	2,297	29
FURY	39	1,695	43
CHRYSLER	35	1,576	45
DART	25	996	39
CORONET	26	991	38
TOTAL - CHRYSLER	204	7,555	38
<b><u>FORD MOTOR COMP.</u></b>			
PINTO	58	1,920	33
MUSTANG	27	999	37
TORINO	260	7,268	27
FORD	153	6,881	44
MERCURY	60	2,266	37
TOTAL - FORD	558	19,344	35
<b><u>GENERAL MOTORS CORP.</u></b>			
BUICK	80	3,224	40
VEGA	43	1,205	28
NOVA	20	656	32
CHEVELLE	126	4,410	35
CHEVROLET	130	4,972	38
MONTE CARLO	21	697	33
OLDSMOBILE	78	3,183	40
CUTLASS	43	1,700	39
PONTIAC	54	2,422	44
TOTAL - GMC	595	22,469	38
<b>TOTAL</b>	<b>1,411</b>	<b>50,777</b>	<b>36</b>

Table A-2  
SAE Survey Results: Distribution of Cars by Model Year

MAKE/SERIES	MODEL YEAR											
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
<u>AMERICAN MOTORS CORP.</u>												
HORNET	0	0	0	0	0	0	3	1	4	8	4	0
MATADOR	0	0	0	0	0	0	0	1	7	9	17	0
TOTAL - AMC	0	0	0	0	0	0	3	2	11	17	21	0
<u>CHRYSLER CORP.</u>												
SATELLITE	0	0	0	0	2	3	1	11	16	21	25	0
FURY	0	0	0	0	0	2	3	6	10	12	6	0
CHRYSLER	0	0	0	1	0	4	4	5	9	9	3	0
DART	0	0	0	0	0	0	5	5	10	5	0	0
CORONET	0	0	0	0	0	3	4	2	7	8	2	0
TOTAL - CHRYSLER	0	0	0	1	2	12	17	29	52	55	36	0
<u>FORD MOTOR COMP.</u>												
PINTO	0	0	0	0	0	0	0	9	25	22	2	0
MUSTANG	0	0	0	0	0	5	5	4	8	4	1	0
TORINO	0	0	0	0	7	0	12	26	65	58	91	1
FORD	0	0	0	1	0	18	14	27	33	48	12	0
MERCURY	0	0	0	0	0	5	3	21	13	12	6	0
TOTAL - FORD	0	0	0	1	7	28	34	87	144	144	112	1
<u>GENERAL MOTORS CORP.</u>												
BUICK	0	0	0	0	0	3	13	12	28	21	3	0
VEGA	0	0	0	0	0	0	0	5	18	11	9	0
NOVA	0	0	0	0	0	1	1	3	3	11	1	0
CHEVELLE	2	1	1	1	2	4	21	16	26	18	34	0
CHEVROLET	0	0	0	0	0	0	12	14	41	29	28	0
MONTE CARLO	0	0	0	0	0	0	2	3	5	8	3	0
OLDSMOBILE	1	0	0	0	0	5	5	10	30	21	6	0
CUTLASS	0	0	0	1	0	4	9	3	8	11	7	0
PONTIAC	0	0	0	0	0	4	7	12	13	14	4	0
TOTAL - GMC	3	1	1	2	2	27	70	78	172	144	95	0
TOTAL	3	1	1	4	11	67	124	196	379	360	264	1



Table A-3  
SAE Survey Results: Reported Number of Failures by  
Automotive Component Subsystem

The following table is a compendium of data taken from our special survey of knowledgeable automobile owners. This data is not a consumer rating for automobile repairability and does not represent a direct comparison between different makes and models of automobiles.

In particular, it should be noted that the number of cars reported varied widely from one model to another, and that the absolute number of reported failures is not an indication of component reliability.

Intensive research is currently underway by NHTSA to develop valid comparisons between different automobiles. Data such as you contributed is a valuable input to this research.

MAKE/SERIES	AUTOMOTIVE COMPONENT/SUBSYSTEM										
	VALVES	CARBURATOR	AUTOMATIC CHOKE	FUEL PUMP	WATER PUMP	RADIATOR SYSTEM	MUFFLER	TAILPIPE	AUTOMATIC TRANSMISSION	EXHAUST PIPE	REAR WHEEL BEARINGS
<u>AMERICAN MOTORS CORP.</u>											
HORNET	10	4	3	0	2	9	3	4	5	1	0
MATADOR	1	3	2	0	2	3	2	0	1	1	0
TOTAL-AMC	11	7	5	0	4	12	5	4	6	2	0
<u>CHRYSLER CORP.</u>											
SATELLITE	9	14	5	7	3	17	18	8	11	8	3
FURY	5	30	14	2	4	12	9	9	3	2	5
CHRYSLER	4	16	6	3	8	16	13	12	4	1	12
DART	2	3	2	4	4	15	15	10	7	1	1
CORONET	3	13	4	4	6	16	15	9	6	6	4
TOTAL-CHRYSLER	23	76	31	20	25	67	71	64	34	18	25
<u>FORD MOTOR COMPANY</u>											
PINTO	13	27	40	29	3	14	10	15	8	5	1
MUSTANG	4	1	2	0	2	9	5	7	3	4	1
TORINO	20	35	18	3	11	37	27	25	12	24	26
FORD	23	42	31	9	25	76	38	37	17	21	7
MERCURY	0	14	12	7	14	29	8	11	8	6	4
TOTAL-FORD	60	145	110	48	55	165	88	95	48	60	39
<u>GENERAL MOTORS CORP.</u>											
BUICK	11	37	15	5	17	54	26	15	8	7	2
VEGA	9	9	7	1	0	10	10	9	12	2	1
NOVA	1	8	6	0	4	8	6	6	3	4	3
CHEVELLE	16	32	18	4	26	30	46	33	19	15	8
CHEVROLET	9	19	21	8	21	35	30	22	10	11	3
MONT CARLO	1	5	1	3	1	6	1	3	0	5	0
OLDSMOBILE	30	14	16	5	19	38	31	24	13	8	7
CUTLASS	2	10	4	2	6	16	13	8	9	4	2
PONTIAC	11	17	8	1	18	13	26	26	13	7	10
TOTAL-GMC	90	151	96	29	112	210	189	146	87	63	36
TOTAL	184	379	242	97	196	454	353	309	175	143	100

**Table A-3**  
**Continued**

The following table is a compendium of data taken from our special survey of knowledgeable automobile owners. This data is not a consumer rating for automobile reparability and does not represent a direct comparison between different makes and models of automobiles.

In particular, it should be noted that the number of cars reported varied widely from one model to another, and that the absolute number of reported failures is not an indication of component reliability.

Intensive research is currently underway by NHTSA to develop valid comparisons between different automobiles. Data such as you contributed is a valuable input to this research.

MAKE/SERIES	AUTOMOTIVE COMPONENT/SUBSYSTEM										
	REAR AXLE SEALS/RETAINER	BRAKE LINING (FRONT)	BRake LINING (REAR)	MASTER CYLINDER	WHEEL CYLINDER	PARKING BRAKE SYSTEM	POWER BRAKE EQUIPMENT	BRake LINES & HOSES	FRONT SHOCKS	REAR SHOCKS	TIE ROD ENDS
<b>AMERICAN MOTORS CORP.</b>											
HORNET	0	3	3	6	1	1	0	1	10	9	0
MATADOR	1	1	0	2	1	0	0	0	11	8	0
TOTAL-AMC	1	4	3	8	2	1	0	1	21	17	0
<b>CHRYSLER CORP.</b>											
SATELLITE	7	18	15	3	6	2	0	4	22	23	3
FURY	3	10	6	1	4	0	1	1	28	21	0
CHRYSLER	4	10	10	1	4	1	0	0	16	15	0
DART	2	10	6	1	4	2	0	0	14	10	2
CORONET	6	6	5	2	2	3	1	0	13	12	1
TOTAL-CHRYSLER	22	54	40	10	20	8	2	5	93	81	6
<b>FORD MOTOR COMPANY</b>											
PINTO	5	9	10	7	2	4	0	0	21	28	2
MUSTANG	2	14	9	4	4	0	0	0	14	12	0
TORINO	24	51	47	8	26	1	9	3	72	72	3
FORD	28	57	61	14	20	5	3	1	81	68	6
MERCURY	4	31	19	3	10	1	1	0	21	14	1
TOTAL-FORD	63	162	146	36	62	11	13	4	209	194	12
<b>GENERAL MOTORS CORP.</b>											
BUICK	5	25	16	5	3	3	0	0	27	22	1
VEGA	7	10	3	1	1	1	0	1	12	6	1
NOVA	2	8	2	1	1	0	0	0	4	4	1
CHEVELLE	7	44	34	8	9	3	3	3	39	35	0
CHEVROLET	5	30	22	0	6	2	3	4	49	39	2
MONTE CARLO	0	3	3	0	0	0	0	0	4	4	0
OLDSMOBILE	13	39	19	3	5	0	2	0	39	31	2
CUTLASS	4	10	10	1	1	0	2	0	23	21	1
PONTIAC	9	18	14	1	0	1	2	0	26	25	3
TOTAL-GMC	52	187	123	20	26	10	12	8	223	187	12
<b>TOTAL</b>	<b>138</b>	<b>220</b>	<b>311</b>	<b>74</b>	<b>110</b>	<b>30</b>	<b>27</b>	<b>18</b>	<b>546</b>	<b>479</b>	<b>30</b>

Table A-3  
Continued

The following table is a compendium of data taken from our special survey of knowledgeable automobile owners. This data is not a consumer rating for automobile repairability and does not represent a direct comparison between different makes and models of automobiles.

In particular, it should be noted that the number of cars reported varied widely from one model to another, and that the absolute number of reported failures is not an indication of component reliability.

Intensive research is currently underway by NHTSA to develop valid comparisons between different automobiles. Data such as you contributed is a valuable input to this research.

MAKE/SERIES	AUTOMOTIVE COMPONENT/SUBSYSTEM										
	VOLTAGE REGULATOR	HEATER SYSTEM	GENERATOR	STARTER	STARTER SOLENOID	DISTRIBUTOR EQUIPMENT	HEATER BLOWER ASSEMBLY	AIR CONDITIONER COMPRESSOR	AIR CONDITIONING RATION EXPANSION VALVE	WINDSHIELD WIPERS (BLADES)	WINDSHIELD WIPERS (MOTOR)
<b>AMERICAN MOTORS CORP.</b>											
HORNET	4	4	1	0	0	1	0	1	0	6	0
MATADOR	1	9	4	0	2	4	2	7	0	20	0
TOTAL-AMC	5	13	5	0	2	5	2	8	0	26	0
<b>CHRYSLER CORP.</b>											
SATFLLITE	14	8	6	6	1	7	5	6	1	47	7
FURY	6	6	4	2	0	3	20	1	34	3	
CHRYSLER	5	9	4	8	1	2	19	0	41	3	
DART	5	7	4	0	0	9	0	1	15	2	
CORONET	5	12	0	5	1	1	2	4	38	3	
TOTAL-CHRYLSE	35	42	18	21	3	26	11	47	7	175	18
<b>FORD MOTOR COMPANY</b>											
PINTO	7	11	5	12	1	32	0	5	0	55	1
MUSTANG	7	7	4	6	3	10	2	6	2	33	1
TORINO	13	20	6	16	9	44	14	51	0	132	7
FORD	24	42	24	45	16	66	8	42	4	171	10
MERCURY	5	14	5	18	6	13	4	9	3	37	4
TOTAL-FORD	56	94	44	97	35	165	28	113	9	428	23
<b>GENERAL MOTORS CORP.</b>											
BUICK	4	30	9	9	5	31	8	18	3	109	3
VEGA	2	3	5	4	2	12	0	0	0	28	2
NOVA	2	4	2	2	2	12	0	1	0	22	3
CHEVELLE	7	14	8	9	7	44	4	12	2	96	8
CHEVROLET	9	16	11	5	5	31	17	52	15	132	4
MONTE CARLO	10	1	3	0	1	5	1	6	2	12	2
OLDSMOBILE	5	18	6	13	6	16	6	11	1	96	7
CUTLASS	2	3	1	2	0	21	7	1	4	44	5
PONTIAC	9	14	7	14	8	10	14	16	9	46	5
TOTAL-GMC	50	103	52	58	36	182	57	117	36	585	39
TOTAL	146	252	119	176	76	378	98	285	52	1214	80

Table A-3  
Continued

The following table is a compendium of data taken from our special survey of knowledgeable automobile owners. This data is not a consumer rating for automobile repairability and does not represent a direct comparison between different makes and models of automobiles.

In particular, it should be noted that the number of cars reported varied widely from one model to another, and that the absolute number of reported failures is not an indication of component reliability.

Intensive research is currently underway by NHTSA to develop valid comparisons between different automobiles. Data such as you contributed is a valuable input to this research.

MAKE/SERIES	AUTOMOTIVE COMPONENT/SUBSYSTEM										
	IDLER ARM	STEERING GEAR	BALL JOINTS	WHEEL BEARINGS	FRONT END ALIGNMENT	UNIVERSAL JOINTS	POINTS & CONDENSORS	SPARK PLUGS	IGNITION COIL	SPARK PLUG WIRES	BATTERY
<b>AMERICAN MOTORS CORP.</b>											
HORNET	1	0	4	0	11	0	33	41	0	2	2
MATADOR	1	2	0	2	16	2	30	36	2	4	5
TOTAL-AMC	2	2	4	2	27	2	63	77	2	6	7
<b>CHRYSLER CORP.</b>											
SATELLITE	2	5	6	13	58	5	58	87	3	12	24
FURY	2	7	3	4	50	6	38	84	2	13	30
CHRYSLER	1	0	0	6	42	7	53	66	5	12	18
DART	1	2	3	12	21	1	55	70	2	3	13
CORONET	1	2	2	5	30	5	44	64	3	11	17
TOTAL-CHRYSLER	7	16	14	40	201	24	248	371	15	51	102
<b>FORD MOTOR COMPANY</b>											
PINTO	0	1	0	1	46	1	149	152	5	30	8
MUSTANG	1	4	3	12	29	3	74	74	4	12	11
TORINO	4	9	13	12	204	8	385	363	7	85	41
FORD	6	18	9	29	200	26	385	427	12	109	71
MERCURY	1	12	1	2	57	9	121	125	6	28	22
TOTAL-FORD	12	44	26	56	536	47	1114	1114	34	264	153
<b>GENERAL MOTORS CORP.</b>											
BUICK	1	5	3	10	121	3	177	176	11	21	11
VEGA	1	1	1	8	31	1	101	104	2	11	1
NOVA	1	1	2	2	13	1	53	44	1	7	4
CHEVELLE	2	6	2	23	109	3	295	275	1	24	49
CHEVROLET	5	6	5	24	152	10	241	261	6	22	30
MONTE CARLO	0	2	1	5	8	2	50	55	0	10	3
OLDSMOBILE	4	6	5	15	128	6	173	191	4	24	18
CUTLASS	3	2	2	8	54	1	99	104	3	9	9
PONTIAC	8	12	7	10	92	1	152	161	1	13	26
TOTAL-GMC	25	41	28	105	708	28	1341	1371	29	141	151
TOTAL	46	103	72	203	1472	101	2766	2933	80	462	412





## APPENDIX B

### LITERATURE SURVEY

During the first three months of the study plan, a literature survey was conducted by National Analysts to gather pertinent information on consumer attitudes, perceptions, and automobile purchasing behavior. Numerous research papers, technical journals and other studies both past and ongoing were investigated to produce a document that summarized in the broadest sense, all work-theoretical, experimental and methodological—that related to automobile buying behavior. The intent of the survey was not only to provide insight into developments in the behavioral science field but also to delineate the history of prior efforts so that needless replication was avoided. This appendix summarizes the literature survey effort under the following headings:

- . Survey objectives
- . Survey approach
- . Significant results and findings.

#### 1. SURVEY OBJECTIVES

The purpose of the survey was twofold (1) to provide an integrated review of pertinent literature dealing with automobile buying behavior and (2) to identify procedures for disseminating information to a large, heterogeneous population. Literature such as the following was identified as important in obtaining such information:

- . Automobile buying behavior. Studies which emphasize the criteria used by consumers and the factors influencing consumer's automobile purchase decisions
- . Segmentation. Theoretical and methodological papers dealing with segmentation by population subgroups of the automobile-buying public's purchasing behavior and decision process behavior
- . Interrelationships. Theoretical and methodological papers dealing with the relationship between consumers' beliefs,

values and preferences, attitudes, behavioral intentions and, ultimately, behavior

- . Information dissemination and diffusion. Studies of the effectiveness of alternate information dissemination methods, especially those relating to belief and attitude change strategies and tactics, and those bearing on consumer decisionmaking
- . Attitude measurement. Theoretical and methodological papers dealing with consumer preference surveys, measurement techniques, and validation of findings.

Because it was anticipated that work dealing with the automobile was limited, studies relating to other consumer products were also investigated. However, it was recognized that automobile buying is very different from the buying of other consumer durables especially because of the much higher original purchase price and the automobiles role in our society. The other studies were nevertheless expected to be helpful as illustrations of the uses of different consumer buying research techniques. The following sections of this appendix describe the approach employed to gather the required information and summarizes the major results and findings.

## 2. SURVEY APPROACH

The survey approach adopted proceeded in three basic steps:

- . Development of a system to categorize the literature to be surveyed
- . Collection of information within each category developed
- . Summarization and integration of pertinent literature into a tight, concise document.

Each step is defined and discussed in detail below.

### (1) Categorization of Literature

The main emphasis of the literature review was to illuminate the behavioral science concepts and to identify the techniques which are applicable in identifying the processes used in forming

consumer preferences and judgments. By categorizing the pertinent literature, specific discussion topics were illuminated thus simplifying both information search and subsequent integration. For the purpose of the program, a classification system was devised which categorized information as aggregate research (i. e., cross-sectioned surveys of attitudes and intentions, usually for the purpose of prediction or segmentation) and as disaggregate research (i. e., focusing on individual consumer's decision processes, usually relationships between needs and goals, perceptions, attitudes, behavioral intentions, and behavior). Starting with this gross level, it was a simple task to classify all information collected, under these two categories. Subcategories were developed and included attitude structure (i. e., relationships among beliefs such as perceived attributes of automobile makes and models and their relationship to attitudes, values and needs) and attitude change (i. e., the process by which car buyers' beliefs and attitudes change). The classification system finally adopted identified all work performed relating to consumer behavior and automobile purchasing and facilitated the execution of subsequent activities.

## (2) Collection of Information

To collect the required information on consumer behavior and automobile purchasing, various leading professional journals, research papers, library abstracts and other technical studies were sought out and explored. Included in this search were leading journals in social psychology, sociology, economics and business management such as the following which were found to publish a great volume of specific relevant information:

- . Journal of Marketing Research
- . Journal of Advertising Research
- . Journal of Marketing
- . Public Opinion Quarterly
- . Journal of Applied Psychology
- . Journal of Business

In addition, material appearing in recent proceedings (e. g., Association for Consumer Research and American Marketing Association Proceedings) and in working paper series from leading university groups were also reviewed and incorporated into the final product.

### (3) Summarization and Integration of Pertinent Literature

At the conclusion of the literature search, a final report was prepared that summarized each study area highlighting the conclusions and major findings. The studies were classified according to the categories developed in Task 1 and specific findings most appropriate to the program were clearly delineated and their relevance established.

The report itself was organized around several related themes to acquaint the reader with the significant literature in the field of consumer behavior. Salient chapters of the report included:

- . Overview of Consumer Behavior
- . Market Segmentation
- . Attitudes and Behavior
- . The Decision Process.

Emphasis was placed on illuminating the behavioral science concepts and techniques applicable in identifying the process used in forming consumer preferences and judgments. In addition, the development of advanced theoretical and measurement techniques involved in conducting empirical research were highlighted. Two other areas which were stressed heavily due to their importance in the conduct of consumer research were consumer attitudes and information processing.

### 3. SIGNIFICANT RESULTS AND FINDINGS

The review of pertinent literature relevant to the automobile purchasing public basically provided two significant results:

- . A substantial background of general and theoretical information on consumer buying factors exists.
- . Detailed data on the specific motivations of automotive buyers of the type required by Title II is not available in the public domain.

As a result of the lack of required detailed data, it was decided a mail panel survey of consumer buying factors was necessary to



obtain the information needed to perform the succeeding stages of the program. The conduct of the buying factors survey and major results obtained are discussed in Appendix C.





## APPENDIX C

### CONSUMER BUYING FACTORS SURVEY

A mail survey, using a national mail panel, was conducted to gather information on the attributes consumers value in automobiles they purchase and the relative weight they place on particular attributes in making their purchase decision. This appendix contains the results of that survey and discusses them under the following headings:

- . Survey objectives
- . Survey approach
- . Significant results and findings
- . Development of prototype consumer messages.

#### 1. SURVEY OBJECTIVES

The objective of the consumer buying factors survey was to identify and evaluate all factors which are important in consumers' decisions to purchase new and used cars. The data resulting from this survey was employed by an advertising firm (Spiro & Associates) to develop prototype materials for dissemination of the required automobile information to consumers. The survey approach developed and the construction of the resulting consumer messages are discussed in the succeeding sections.

#### 2. SURVEY APPROACH

The survey was based upon the use of an expectancy-value model to represent the factors used in the decision to purchase an automobile. The model is built on the proposition that an individual's attitude toward any object is a function of the strength of his beliefs about the object and the evaluative aspects of those beliefs. In other words, people who most prefer a particular automobile hold an attitude toward that automobile characterized by a high degree of certainty that (a) the brand possesses attributes he values highly and (b) the brand does not possess attributes he values negatively. By knowing the value of each attribute (V) in the purchase decision and the extent to which each brand under consideration possesses each

attribute (E), a measure of the overall attitude toward a particular brand can be obtained (i. e., attitude =  $\Sigma EV$ ).

The expectancy-value model was chosen for this study because of its capability to develop separate belief strength and evaluation scores for every attribute important to the purchase decision. Knowledge of such information was found to be extremely useful in designing alternative information concepts discussed later in this appendix.

To carry out the survey, the National Family Opinion (NFO) mail panel organization was solicited and 4,000 of their 65,000 panel members were selected at random to participate in the survey. A questionnaire was developed based on the expectancy-value approach described above and mailed to each selected household. The members of the household who were most active in the most recent automobile purchase or who probably would have the most to say about the next automobile purchase were asked to complete the form. All responses were coded upon receipt and transferred to IBM computer cards. Statistical tables of results were generated and analyses performed. A summary of the most significant results and findings is presented in the next section.

### 3. SIGNIFICANT RESULTS AND FINDINGS

Mail panels do not provide a high quality sample. Even though they may be correctly balanced on major demographic characteristics, participants in a mail panel cannot be assumed to be representative of the total population. Their very participation in the panel probably indicates that they are "different." For example, they may be unusually cooperative people, or have an unusual liking for completing questionnaires, or be more "rational" in orientation than average. Thus, any generalization of the results presented herein should be cautious.

Comparison of the data in Table C-1 shows that, while the total NFO panel is representative demographically of the U. S. population, the sample that returned a usable questionnaire was more highly educated than the population. It included fewer young and fewer old people than the total population (i. e., more people between ages 30 and 59) and it overrepresented those in the middle income range.

Table C-1  
Comparison of NFO Sample and U. S. Population Statistics

	<u>Sample</u>	<u>U. S. Census</u>
	(Male heads of households)	(1975—Heads of Households)
<u>Education</u>		
Attended grade school	7	12
Graduated grade school	7	10
Attended high school	14	15
Graduated high school	34	33
Beyond high school	37	29
	<u>100%</u>	<u>100%</u>
<u>Income</u>		( 1971)
Under \$5, 000	18	25
\$5, 000 - \$14, 999	62	47
\$15, 000 and over	20	28
	<u>100%</u>	<u>100%</u>
<u>Age (females)</u>		(1972 — 18 and older)
Under 30	19	28
30 - 59	64	50
60 and over	17	22
	<u>100%</u>	<u>100%</u>

These sample discrepancies are an additional reason for caution in generalizing the research results, and for viewing them as something less than documented conclusions about the population.

A total of 2, 652 usable responses were received for a return rate of 66 percent. The sample consisted of two types of car buyers—those who said their next car purchase would be a new car (1, 627), and those who said they would purchase a used car (1, 025). Special analysis of the responses were conducted. A summary of the most significant results and findings are presented under the following headings:

- . The importance of car attributes to new car buyers
- . The importance of car attributes to used car buyers
- . Ratings of automobiles
- . Sources of information in car purchase selection
- . Brand loyalty.

(1) The Importance of Car Attributes to New Car Buyers

Of the total sample, 61 percent indicated that the next car purchase would probably be a new car rather than a used car. These respondents rated 33 characteristics of cars to show how important each characteristic was in choosing a type of car to buy and in choosing a specific car from within a type.

Respondents rated the characteristics twice in this way because past research, consisting primarily of depth interviewing, suggested that the process of buying a car could be validly represented as consisting of two stages. First, a type or class of car is chosen (i.e., small, intermediate, large). Second, a specific make and model is chosen from within the type.

While the two-stage theory has many implications, its importance to Title II stems from the assertion that attributes may be weighed differently during the two stages of the process and thus, there are two places where Title II can make an impact. Unfortunately, however, the data collected in the survey did not substantiate this theory. That is, respondents did not reflect in their answers the kinds of decisions postulated by the theory. (Existence of a two-stage buying process was further tested and verified in subsequent group depth interviews. See Appendix D). The data did, however, reflect what attributes consumers consider important in cars they buy. These results are reported in the following subsections:

- . Relative importance of attributes
- . Demographic characteristics and attribute ratings
- . Type of car considered and attribute ratings
- . Car orientation and attribute ratings.



## 1. Relative Importance of Attributes

Respondents rated practical attributes of cars, such as dependability, crashworthiness, low cost maintenance, low depreciation, good gas mileage and low susceptibility to accident damage, very high. It was concluded highly unlikely that all such attributes are really more important in car choice than styling or comfort and that the respondents sublimated their true opinions and exaggerated their own rationality and attention to practical or utilitarian values. What the respondents seemed to be revealing was what they viewed should be important in cars. If this is true, Title II variables were observed to be very important.

## 2. Demographic Characteristics and Attribute Ratings

Analysis of the results by demographic characteristics provided some indication as to what segments of the public would be most impacted by Title II information. The results were as follows:

- . In every case, women tended to rate Title II related characteristics higher in importance than men.
- . In every case, older people tended to rate Title II attributes higher than younger people.
- . In every case, those with less education tended to rate Title II attributes higher than those with more education. (This might be explained by the hypothesis that those with more education better understood the rating task, and/or were more honest in reporting what really influences their decisions, and those with less education were more impressed by the Title II areas.)
- . Higher ratings were obtained from those with low incomes for Title II attributes that involved financial considerations (i.e., maintenance costs). There was little difference in the income groups in the importance assigned to safety.

### 3. Type of Car Considered and Attribute Ratings

Respondents were asked to list an actual make and model they would consider purchasing. These were coded into three categories (small, medium, large) and tabulated against the list of attributes respondents rated as high in importance to them when selecting a car to purchase. Analysis of the data provided the following results:

- . Small, intermediate, and large car buyers all rated Title II attributes high.
- . Large car buyers rated safety attributes higher, and small car buyers rated maintenance attributes higher.
- . The basic difference between small and large car buyers involved financial considerations more than such items as nimbleness or maneuverability. Most small car buyers seem to prefer big car attributes, but are making a compromise for financial reasons.

### 4. Car Orientation and Attribute Ratings

All respondents were asked to report agreement, on a four-point scale, with a series of statements reflecting attitudes toward cars and driving. The analysis of these responses permitted identification of certain population segments who rated particular car attributes high in importance to them. The results of this analysis are summarized below:

- . Safety conscious people, by definition, rated the safety-related attributes higher. They also rated higher most of the other practical aspects of cars. However, they are not attracted to "plain cars." They also rated higher roominess, luxury, comfortable ride, attractiveness, effortless highway cruising, etc. In short, the safety conscious people seem big car oriented, involving most of the big car attributes.

- . Status conscious people, in addition to the predictable attributes of luxury and status, rated size and weight higher. They showed less interest in cost of maintenance and repair, and no difference on crashworthiness and susceptibility to accident damage.
- . Car buffs were less interested in all the Title II variables.

(2) The Importance of Car Attributes to Used Car Buyers

Those respondents who indicated their next car purchase would probably be a used car were asked to rate in order of importance to them in choosing a used car, the 33 attributes listed in the questionnaire plus some attributes relevant only in a used car purchase. The results were as follows:

- . The highest scoring areas of all were those that applied uniquely to the condition of a used car such as good body condition or engine that seems tight and solid.
- . The Title II areas still ranked relatively high. Evidently, used car buyers are not uninterested in new car ratings.
- . As with the new car buyers, women seemed more interested in the Title II areas than men, and older people were more interested than young people. The pattern with income and education was also similar to that obtained with new car buyers.

(3) Ratings of Automobiles

Following the two-stage theory, respondents were asked to rate first, the extent to which the types (i. e., class—compact, intermediate) of automobiles possessed

each of the attributes and second, the extent to which the individual make/models they would consider possessed those attributes. Findings related to the types of automobiles were as follows:

- . Larger automobiles were believed to be much more safe in the event of an accident than smaller automobiles.
- . Large automobiles were seen as less likely to be involved in an accident.
- . Small automobiles were believed to cost less regarding maintenance and repair.
- . Small automobiles were believed to have lower insurance costs.
- . Small automobiles were believed to sustain more damaging minor accidents.

A comparison was then made of the way respondents rated their specific make/model preferences and their ratings of the car class that included their preferences. Areas where they rated their choice higher than they rated the class as a whole was taken to reveal what especially concerns them about specific make/model choices within a class. The results were as follows:

- . Small car buyers seemed especially concerned with roominess, heavy weight, crashworthiness, and ride quality. In other words, having chosen the small car type, they want a "big" small car.
- . Large car buyers, in the same way, stressed gas mileage, low cost maintenance and repairs, inexpensive accident repair, and low cost.

These findings suggested that the two-stage buying theory is accurate but that the respondents here were not able to fully represent their decision-making process through a written response questionnaire.



(4) Sources of Information on the Car  
Purchase Selection

Respondents were asked to indicate what sources of information they would use next time they bought a car. The three sources of information most often mentioned dealt with personal experience — own past experience with the make or model (96%), the test drive (79%), and the showroom examination (69%).

The opinions of relatives and friends, those of a professional mechanic and news stories about recalls and accident rates were also valued highly but not as much as personal experience. Information from salesmen, newspaper articles about car tests, manufacturers' brochures, advertising and car magazines were relied upon less heavily. The only printed media that scored fairly high was Consumer Reports or similar publications (58%).

(5) Brand Loyalty

Respondents were asked to report the make and model of the last five cars they bought (or all the cars if the number was less than five) to investigate the extent people bought the same make car over and over again termed "brand loyalty." Based on analysis of the data, it was found brand loyalty is in fact, substantial and plays an important role in car purchase selection. To the extent that brand loyalty exists, the impact of additional consumer information, such as Title II data, will be minimized.

4. DEVELOPMENT OF PROTOTYPE CONSUMER MESSAGES

Based on the above results and input from NHTSA and other contractors, seven concepts to convey the Title II information to specific consumer groups were developed in rough form. The format and process of refinement of these concepts is discussed in detail in Appendix D.





## APPENDIX D

### GROUP DEPTH INTERVIEWS

To field test the preliminary consumer messages, a series of 12 group depth interviews with consumers was conducted in December 1974. This appendix summarizes the results of these interviews under the following headings:

- . Objectives
- . Experimental design
- . Significant results and findings.

#### 1. OBJECTIVES

The primary purpose of the group depth interviews was to learn enough about consumer reaction to the preliminary Title II messages to screen and refine them for use in a national survey and supplementary group depth interviews. Group depth interviews have proven to be an extremely efficient way of pretesting advertising campaign strategies at minimal cost. The experimental design and usefulness of group depth interviews is explained in the next section.

#### 2. EXPERIMENTAL DESIGN

Group depth interviews are sessions where a small group is assembled to openly discuss topics of common knowledge. Typically, the group will consist of seven or eight consumers and an experienced psychologist moderator. The moderator will propose a topic in which the consumers are asked to respond in a free-flowing discussion. The moderator's job is to keep the conversation going and to keep the participants focused on the subject. By the subtle probing of the moderator, unspoken perceptions, real attitudes and motives among group members are often revealed while the presence of social peers stimulates participants to be more spontaneous and candid than they would normally be during personal interviews.

A series of group depth interviews was conducted as part of the study to test the rough communication concepts. Copies of each concept were presented in each group and were critically responded to in

an open discussion. The remaining parts of this section addresses the communication concepts presented to the groups and the conduct of the group depth interviews themselves. The results obtained are presented in Section 3.

(1) Presentation of Alternate Communication Concepts

As previously mentioned, an advertising firm developed several alternate communication concepts to be tested on consumers in group depth interviews (Figures D-1 through D-7). Seven messages were developed and displayed on large poster boards. The poster boards contained information about the crashworthiness, damage susceptibility and maintenance costs of 19 different automobiles and differed only in the headline and copy introducing the Title II ratings. Alternate forms of the headlines included the following:

- . "HOW SAFE ARE THE NEW CARS? HOW MUCH DO THEY COST TO MAINTAIN? HOW MUCH DO THEY COST TO REPAIR?"
- . "HOW TO FIND OUT WHICH CARS GIVE YOU THE BEST CHANCE OF WALKING AWAY FROM THAT ACCIDENT YOU NEVER THINK YOU'LL HAVE."
- . "AFTER THOUSANDS OF DELIBERATE CRASHES, BREAKDOWNS, AND TUNEUPS, HERE'S WHAT THE GOVERNMENT FOUND OUT ABOUT NEW CAR SAFETY AND RELIABILITY."
- . "SOME CARS ARE BUDGET-STRETCHERS. OTHERS ARE BUDGET-BUSTERS. HERE'S HOW TO TELL THEM APART."
- . "WHICH CAR COSTS AN AVERAGE OF \$650 TO REPAIR? WHICH ONE COSTS \$275?"
- . "THERE ARE THREE NEW WAYS TO RATE 1975 CARS. TWO OF THEM COULD SAVE YOU MONEY. ONE OF THEM COULD SAVE YOUR LIFE."

Copies of the actual poster boards used in the group depth interviews are presented in Figures D-1 through D-7. You will note that the crashworthiness portion of Title II, and not damage susceptibility and maintenance, was varied between posters. This was done to test out various methods of communicating crashworthiness due to anticipated consumer difficulty in understanding that concept. It was decided that the units (dollars) used to present damage susceptibility and maintenance were readily understandable. You will also note that the car names have been omitted from the posters. This was done as a precaution to protect the manufacturers from unjust criticism since the ratings are hypothetical. In the actual groups, however, real car names were used and the respondents were led to believe, until the end of the session, that they were being shown real ratings.

## (2) Conduct of Group Depth Interviews

Twelve group depth interviews were conducted, four each in three different cities:

- . Detroit, which represented a major metropolitan area where the automobile is a central part of the life style
- . Philadelphia, which represented a major urban center where the system of mass transit makes automobile ownerships less important
- . York (Pennsylvania), which represented a small nonurban area.

Each group session consisted of approximately eight consumers representing a particular income class (above or below \$15,000) and sex. The session lasted approximately two hours during which time the participants discussed the topics that were presented by the psychologist group moderator. During the interview, each group was exposed to the alternate consumer messages that had been prepared regarding Title II information. Each group discussion was tape-recorded and the responses analyzed. The results of the interviews are presented in the next section.



FIGURE D-1  
Title II Consumer Message

**U.S. GOVERNMENT REPORTS TELL YOU:**

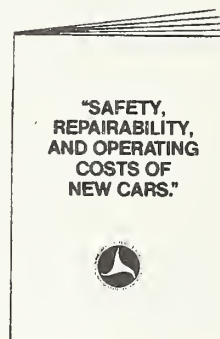
# How safe are the new cars? How much will they cost to maintain? How much will they cost to repair?

Three questions you should ask before you buy a new car. Three questions car dealers don't always like to answer. But you can find the facts in a valuable new U.S. Government booklet: "Safety, Repairability, and Operating Costs of New Cars."

This booklet rates all leading makes of new cars. It tells you how well each car survives an accident (and how much of a chance it gives you.)

It tells you how much you're likely to spend on repairs. And it tells you how much you're likely to spend on maintenance. So if you're concerned about your safety, the safety of your passengers, and your budget, you owe it to yourself to read this report before you make any car-buying decision.

Pick up a copy at any Post Office. Or write for it at this address: 1975 Car Ratings, U.S. Government Printing Office, 2750 Illinois Avenue, Washington, D.C. 20215.



U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
WASHINGTON D.C. 20590



FIGURE D-2  
Title II Consumer Message

**U.S. GOVERNMENT REPORTS TELL YOU:**

# Some new cars are budget-stretchers. Others are budget-busters. Here's how to tell them apart:

Safety, Repairability, Operating costs. Important factors to consider before you buy a car.

To help you get the facts, the U.S. Department of Transportation tested and researched different models of cars. They found out that some cars cost less to repair, some cost less to run, and some give you a better chance of walking away from an accident.

The results of these tests are shown in the tables printed above. You can also get a more complete version of this report in the booklet, "Safety, Repairability, and Operating Costs of New Cars" at any Post Office. Or by writing to: 1975 Car Ratings, U.S. Government Printing Office, 2750 Illinois Avenue, Washington, D.C. 20215.



U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
WASHINGTON D.C. 20590

MODEL	AVERAGE MAINTENANCE COSTS 1973-75 MODELS (2)	PREDICTED MAINTENANCE COSTS 1978 MODELS
<b>SMALL CARS</b>		
	\$155	\$130
	170	130
	185	145
	175	170
	188	175
	200	210
	(no rating)	(no rating)
AVERAGE FOR ALL SMALL CARS TESTED	180	160
<b>INTERMEDIATE CARS</b>		
	\$160	\$160
	170	170
	175	170
	200	180
	260	200
	300	250
	340	260
	355	285
AVERAGE FOR ALL INTERMEDIATE CARS TESTED	290	210
<b>LARGE CARS</b>		
	\$400	\$260
	450	300
	500	480
	560	540
AVERAGE FOR ALL LARGE CARS TESTED	450	390

(2) This is an annual figure. It represents a combination of both preventive maintenance (oil changes, maintenance required to keep warranty in effect, etc.) and corrective maintenance (spark plugs, fan belts, etc.).

MODEL	AVERAGE ACCIDENT REPAIR COSTS 1973-75 MODELS (1)	PREDICTED ACCIDENT REPAIR COSTS 1978 MODELS
<b>SMALL CARS</b>		
	\$375	\$275
	395	200
	450	325
	500	450
	530	400
	500	500
	(no rating)	475
AVERAGE FOR ALL SMALL CARS TESTED	425	405
<b>INTERMEDIATE CARS</b>		
	\$300	\$300
	325	350
	335	360
	360	360
	400	400
	450	525
	460	500
	(no rating)	380
AVERAGE FOR ALL INTERMEDIATE CARS TESTED	410	475
<b>LARGE CARS</b>		
	\$475	\$525
	550	550
	675	700
	750	725
AVERAGE FOR ALL LARGE CARS TESTED	660	680

(1) Three types of accidents were used in this test. The dollar figure in the chart represents the total cost of all three types of accidents.

MODEL	CRASHWORTHINESS RATING	PROBABILITY OF FATALITY OR SERIOUS INJURY (3)
<b>SMALL CARS</b>		
	Above average	75
	Above average	71
	Average	63
	Average	59
	Below average	46
	Below average	31
	Below average	29
<b>INTERMEDIATE CARS</b>		
	Above average	88
	Above average	83
	Average	78
	Average	72
	Average	63
	Below average	54
	Below average	51
	Below average	49
<b>LARGE CARS</b>		
	Above average	92
	Average	90
	Average	85
	Below average	82

(3) A serious injury is one resulting in two or more days of hospitalization.

FIGURE D-3  
Title II Consumer Message

**U.S. GOVERNMENT  
REPORTS  
TELL YOU:**

**After thousands of deliberate crashes, breakdowns, and tuneups, here's what the government found out about new car safety and reliability:**

Do some cars withstand accidents better than others? Do some cost less to operate? Do some cost more to repair? To get the answers to these questions, the U.S. Department of Transportation spent months testing various models of cars.

And they found out that there are important differences between various models of cars. Differences you should know about if you're planning to buy a car.

The tables printed below give you the facts about crash-

worthiness, costs of repairing accidents, and yearly operating expenses. If you'd like more complete information, you can get it in a booklet titled "Safety, Repairability, and Operating Costs of New Cars" at any Post Office. Or by writing to: 1975 Car Ratings, U.S. Government Printing Office, 2750 Illinois Avenue, Washington, D.C. 20215.



U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
WASHINGTON, D.C. 20590

MODEL	CRASHWORTHINESS RATING	PROBABILITY OF FATALITY OR SERIOUS INJURY (3)	MODEL	AVERAGE ACCIDENT REPAIR COSTS, 1973-75 MODELS (1)	PREDICTED ACCIDENT REPAIR COSTS, 1976 MODELS	MODEL	AVERAGE MAINTENANCE COSTS 1973-75 MODELS (2)	PREDICTED MAINTENANCE COSTS, 1976 MODELS	
SMALL CARS			SMALL CARS			SMALL CARS			
	Above average	75	7.8	\$375	\$275		\$155	\$130	
	Above average	71	8.7	395	200		170	130	
	Average	63	8.9	450	325		185	145	
	Average	59	6.3	500	450		175	170	
	Below average	46	5.9	530	400		188	175	
	Below average	31	7.2	500	500		200	210	
	Below average	29	5.2	(no rating)	475		(no rating)	(no rating)	
				AVERAGE FOR ALL SMALL CARS TESTED	425	405	AVERAGE FOR ALL SMALL CARS TESTED	180	160
INTERMEDIATE CARS			INTERMEDIATE CARS			INTERMEDIATE CARS			
	Above average	88	3.9	\$300	\$300		\$180	\$160	
	Above average	83	5.2	325	350		170	170	
	Average	78	6.2	335	360		175	170	
	Average	72	4.7	360	360		200	180	
	Average	63	4.2	400	400		260	200	
	Below average	54	3.7	450	525		300	250	
	Below average	51	4.5	460	500		340	260	
	Below average	49	4.9	(no rating)	380		355	265	
				AVERAGE FOR ALL INTERMEDIATE CARS TESTED	410	475	AVERAGE FOR ALL INTERMEDIATE CARS TESTED	290	210
LARGE CARS			LARGE CARS			LARGE CARS			
	Above average	92	3.4	\$475	\$525		\$400	\$260	
	Average	90	2.9	550	550		450	300	
	Average	85	5.1	675	700		500	460	
	Below average	82	4.6	750	725		560	540	
				AVERAGE FOR ALL LARGE CARS TESTED	660	680	AVERAGE FOR ALL LARGE CARS TESTED	450	390

(3) A serious injury is one resulting in two or more days of hospitalization.

(1) Three types of accidents were used in this test. The dollar figure in the chart represents the total cost of all three types of accidents.

(2) This is an annual figure. It represents a combination of both preventive maintenance (oil changes, maintenance required to keep warranty in effect, etc.) and corrective maintenance (spark plugs, fan belts, etc.).

FIGURE D-4  
Title II Consumer Message

**U.S. GOVERNMENT REPORTS TELL YOU:**

# WHICH CAR COSTS AN AVERAGE OF \$650 TO REPAIR? WHICH ONE COSTS \$275?

MODEL	AVERAGE ACCIDENT REPAIR COSTS, 1973-75 MODELS (1)	PREDICTED ACCIDENT REPAIR COSTS, 1976 MODELS	MODEL	AVERAGE MAINTENANCE COSTS, 1973-75 MODELS (2)	PREDICTED MAINTENANCE COSTS, 1976 MODELS	MODEL	CRASHWORTHINESS RATING	PROBABILITY OF FATALITY OR SERIOUS INJURY (3)
<b>SMALL CARS</b>			<b>SMALL CARS</b>			<b>SMALL CARS</b>		
	\$375	\$275		\$155	\$130	Above average	75	7.8
	395	200		170	130	Above average	71	6.7
	450	325		185	145	Average	63	8.9
	500	450		175	170	Average	59	6.3
	530	400		188	175	Below average	48	5.9
	500	500		200	210	Below average	31	7.2
	(no rating)	475		(no rating)	(no rating)	Below average	29	5.2
AVERAGE FOR ALL SMALL CARS TESTED	425	405	AVERAGE FOR ALL SMALL CARS TESTED	180	160			
<b>INTERMEDIATE CARS</b>			<b>INTERMEDIATE CARS</b>			<b>INTERMEDIATE CARS</b>		
	\$300	\$300		\$180	\$160	Above average	86	3.9
	325	350		170	170	Above average	83	5.2
	335	360		175	170	Average	78	6.2
	360	360		200	180	Average	72	4.7
	400	400		260	200	Average	63	4.2
	450	525		300	250	Below average	54	3.7
	460	500		340	260	Below average	51	4.5
	(no rating)	380		355	265	Below average	49	4.9
AVERAGE FOR ALL INTERMEDIATE CARS TESTED	410	475	AVERAGE FOR ALL INTERMEDIATE CARS TESTED	290	210			
<b>LARGE CARS</b>			<b>LARGE CARS</b>			<b>LARGE CARS</b>		
	\$475	\$525		\$400	\$260	Above average	92	3.4
	550	550		450	300	Average	90	2.9
	875	700		500	480	Average	85	5.1
	750	725		560	540	Below average	82	4.6
AVERAGE FOR ALL LARGE CARS TESTED	660	680	AVERAGE FOR ALL LARGE CARS TESTED	450	390			
(1) Three types of accidents were used in this test. The dollar figure in the chart represents the total cost of an three types of accidents.			(2) This is an annual figure. It represents a combination of both preventive maintenance and changes in maintenance required to keep warranty in effect etc. (and corrective maintenance (spark plugs, fan belts, etc.).			(3) A serious injury is one resulting in two or more days of hospitalization.		

If you're a typical American driver, you're paying a lot more attention to economy than you used to. But economy is more than just mileage. That's why the U.S. Department of Transportation tested and researched different models of cars to find out which ones cost less to repair and to run.

They also found out which models give you a better chance of surviving an accident without

serious injury. And you'll find all this information in the tables printed above.

If you'd like a version of this report in booklet form, just pick up a copy of "Safety, Repairability, and Operating Costs of New Cars" at any Post Office. Or write: 1975 Car Ratings, U.S. Government Printing Office, 2750 Illinois Avenue, Washington, D.C. 20215.



U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
WASHINGTON, D.C. 20590



FIGURE D-5  
Title II Consumer Message

US Government reports tell you:

# HOW TO FIND OUT WHICH CARS GIVE YOU THE BEST CHANCE OF WALKING AWAY FROM THAT ACCIDENT YOU NEVER THINK YOU'LL HAVE:

If you don't think you can crack up in your car, think again. Because accidents can happen to anyone. Anytime. Anyplace. And whether or not you're seriously injured can often depend on the model and type of car you're driving.

Crashworthiness is just one of the facts to come out of months of testing and researching by the federal government. This Department of Transportation project also learned how much it costs, by model, to repair accident damage and what yearly operating expenses the

owner of one of these cars can expect to lay out.

You'll find these facts in the tables printed on this page. If you'd like a more complete report on these government findings, you can pick up a copy of the booklet, "Safety, Repairability, and Operating Costs of New Cars" at any Post Office. Or write this address: 1975 Car Ratings, U.S. Government Printing Office, 2750 Illinois Avenue, Washington, D.C. 20215.



U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
WASHINGTON, D.C. 20590

MODEL	CRASHWORTHINESS RATING	PROBABILITY OF FATALITY OR SERIOUS INJURY (3)
<b>SMALL CARS</b>		
	Above average 75	7.8
	Above average 71	6.7
	Average 63	8.9
	Average 59	6.3
	Below average 46	5.9
	Below average 31	7.2
	Below average 29	5.2
<b>INTERMEDIATE CARS</b>		
	Above average 86	3.9
	Above average 83	5.2
	Average 78	6.2
	Average 72	4.7
	Average 63	4.2
	Below average 54	3.7
	Below average 51	4.5
	Below average 49	4.9
<b>LARGE CARS</b>		
	Above average 92	3.4
	Average 90	2.9
	Average 85	5.1
	Below average 82	4.6

3 A serious injury is one resulting in two or more days of hospitalization.

MODEL	AVERAGE ACCIDENT REPAIR COSTS 1973-75 MODELS (1)	PREDICTED ACCIDENT REPAIR COSTS 1976 MODELS	AVERAGE MAINTENANCE COSTS 1973-75 MODELS (2)	PREDICTED MAINTENANCE COSTS 1976 MODELS
<b>SMALL CARS</b>				
	\$375	\$275	\$155	\$130
	395	200	170	130
	450	325	185	145
	500	450	175	170
	530	400	188	175
	500	500	200	210
	(no rating)	475	(no rating)	(no rating)
AVERAGE FOR ALL SMALL CARS TESTED	425	405	180	160
<b>INTERMEDIATE CARS</b>				
	\$300	\$300	\$180	\$160
	325	350	170	170
	335	360	175	170
	360	360	200	180
	400	400	260	200
	450	525	300	250
	460	500	340	260
	(no rating)	380	355	265
AVERAGE FOR ALL INTERMEDIATE CARS TESTED	410	475	290	210
<b>LARGE CARS</b>				
	\$475	\$525	\$400	\$260
	550	550	450	300
	675	700	500	480
	750	725	560	540
AVERAGE FOR ALL LARGE CARS TESTED	660	680	450	390

(1) These types of accidents were noted in this test. The dollar figure in the chart represents the total cost of all three types of accidents.

(2) This is an annual figure. It represents a combination of both preventive maintenance (oil changes, maintenance required to keep warranty in effect, etc.) and corrective maintenance (spark plugs, fan belts, etc.).

FIGURE D-6  
Title II Consumer Message

U.S. GOVERNMENT REPORTS TELL YOU:

**There are three new ways  
to rate 1975 cars.  
Two of them could save you money.  
One of them could save your life.**

MODEL	CRASHWORTHINESS RATING	PROBABILITY OF FATALITY OR SERIOUS INJURY (3)	AVERAGE ACCIDENT REPAIR COSTS: 1973-75 MODELS (1)	PREDICTED ACCIDENT REPAIR COSTS: 1976 MODELS	AVERAGE MAINTENANCE COSTS: 1973-75 MODELS (2)	PREDICTED MAINTENANCE COSTS: 1976 MODELS	
SMALL CARS							
	Above average	75	7.8	\$375	\$275	\$155	\$130
	Above average	71	6.7	395	200	170	130
	Average	63	8.9	450	325	185	145
	Average	59	6.3	500	450	175	170
	Below average	46	5.9	530	400	188	175
	Below average	31	7.2	500	500	200	210
	Below average	29	5.2	(no rating)	475	(no rating)	(no rating)
AVERAGE FOR ALL SMALL CARS TESTED			425	405	180	160	
INTERMEDIATE CARS							
	Above average	86	3.9	\$300	\$300	\$180	\$160
	Above average	83	5.2	325	350	170	170
	Average	78	6.2	335	360	175	170
	Average	72	4.7	360	360	200	180
	Average	63	4.2	400	400	260	200
	Below average	54	3.7	450	525	300	250
	Below average	51	4.5	460	500	340	260
	Below average	49	4.9	(no rating)	380	355	265
AVERAGE FOR ALL INTERMEDIATE CARS TESTED			410	475	290	210	
LARGE CARS							
	Above average	92	3.4	\$475	\$525	\$400	\$260
	Average	90	2.9	550	550	450	300
	Average	85	5.1	675	700	500	480
	Below average	82	4.6	750	725	560	540
AVERAGE FOR ALL LARGE CARS TESTED			660	680	450	390	

1: These types of accidents were used in this test. The dollar figure in the chart represents the total cost of all in one types of accidents.

2: This is an annual figure. It represents a combination of both preventive maintenance (oil changes, maintenance required) to keep wear/tear in effect, etc., and correction maintenance (spark plugs, fan belts, etc.).

3: A serious injury is one resulting in two or more days of hospitalization.

1: Three types of accidents were used in this test. The dollar figure in the chart represents the total cost of all three types of accidents.

2: This is an annual figure. It represents a combination of both preventive maintenance (oil changes, maintenance required to keep warranty in effect, etc.) and corrective maintenance (spark plugs, fan belts, etc.).

3: A serious injury is one resulting in two or more days of hospitalization.

These ratings are the results of months of testing by the U.S. Department of Transportation. And if you care about safety and economy, you'd better take a close look at them.

They tell you, in dollars and cents, how much you can expect to pay to repair an accident; how much it'll cost you to maintain each particular model; and how well the different

models protect you in the event of an accident.

Economy and safety are two very important factors to consider before you buy a new car. The government wants you to have the facts, in black and white, to help you make your decision.



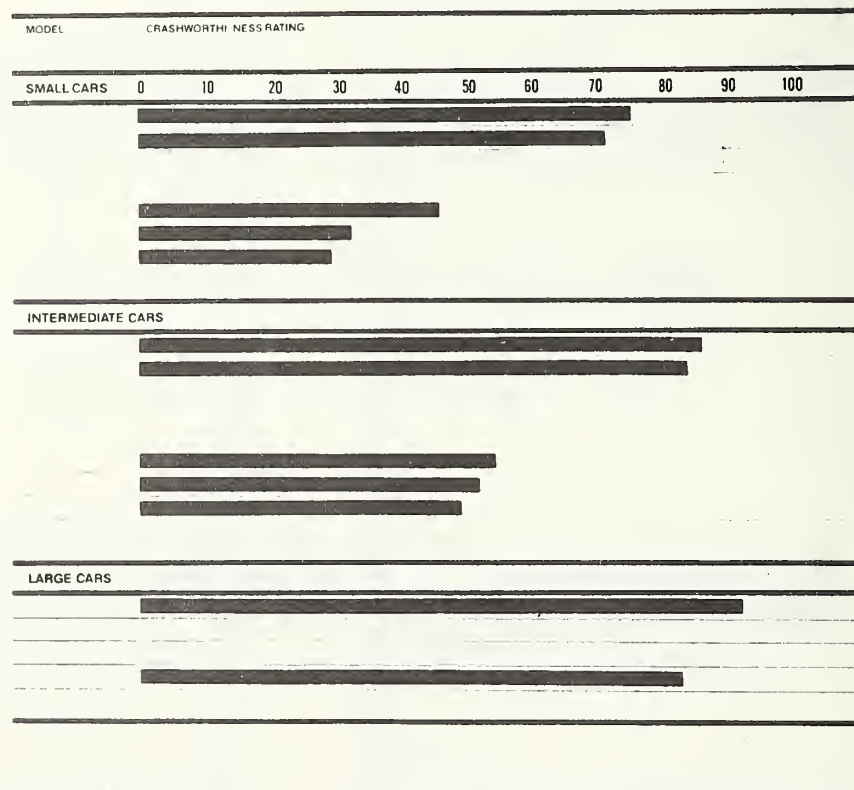
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
WASHINGTON, D.C. 20590



# HOW TO FIND OUT WHICH CARS GIVE YOU THE BEST CHANCE OF WALKING AWAY FROM THAT ACCIDENT YOU NEVER THINK YOU'LL HAVE:

Crashworthiness is just one of the facts to come out of months of testing and researching by the federal government. This Department of Transportation project also learned how much it costs, by model, to repair accident damage and what yearly operating expenses the

You'll find these facts in the tables printed on this page. If you'd like a more complete report on these government findings, you can pick up a copy of the booklet, "Safety, Reliability, and Operating Costs of New Cars" at any Post Office. Or write this address: 1975 Car Ratings, U.S. Government Printing Office, 2750 Illinois Avenue, Washington, D.C. 20215.



### 3. SIGNIFICANT RESULTS AND FINDINGS

The interpretation of the research findings using group depth interviews should be viewed with two factors in mind. First, the number of respondents was obviously very small and they were not selected by scientifically accepted sampling techniques. Second, the tape-recorded data was analyzed qualitatively with an obvious potential for subjectivity on the part of the analyst. Therefore, the findings from the group depth interviews are better regarded as likely hypotheses than as firmly documented conclusions. However, the method is sufficiently precise to serve the primary goal of learning enough about the Title II messages to refine them for a later quantitative test.

The findings of the groups can be divided into four areas:

- . Content and format of four different Title II messages
- . Importance of various automobile characteristics in car purchase selection
- . Relative consumer interest in the three Title II variables
- . Relative impact of Title II ratings on the automobile buying public.

These will be discussed in detail in the following sections:

- . Automobile buying practices
- . Importance of safety, damageability and maintenance costs
- . Overall reaction to the prospect of the ratings
- . Evaluation of the headlines
- . Content and format of the ratings.

#### (1) Automobile Buying Practices

The group depth interviews provided a considerable amount of support for the two-stage theory of automobile buying in which the first stage is a sharp restriction of the automobile to be considered, and the second stage is a process of considering, shop-

ping, and comparing a relatively small number of automobiles. For instance, it was found that in the first stage the following automobile characteristics are of primary importance to the consumer:

- . Size. Most consumers restrict their active shopping and comparison to automobiles of a similar size
- . Price
- . Body style. Active shopping is often restricted to automobiles of a similar style as opposed to making a final decision among three different styles such as a stationwagon, a sports car, and a four-door sedan
- . Make/manufacturers. Very often, prejudices for or against certain makes or manufacturers restrict the choices that are ever actively considered. In other words, there is no chance that certain automobiles will be bought because the consumer does not even perceive them as something worth buying.

This two-stage theory has obvious implications for successfully accomplishing the Title II program as was discussed in the previous appendix since there are two types of decisions upon which the Title II information can have an impact. This is consistent with the findings of the consumer buying factors study (See Appendix C(8)).

(2) Importance of Safety, Damageability and Maintenance Costs

The group depth interviews did not attempt an exhaustive search for all relevant automobile characteristics. However, they did illustrate the depth of the context within which automobile characteristics must be viewed and within which the three Title II characteristics (safety, damageability and maintenance costs) must operate. Both before and after presentation of the consumer messages in the group sessions, an attempt was made to evaluate the way in which consumers might use the characteristics that Title II covers in their car selections. The results are as follows:

1. Safety (Crashworthiness)

There were four basic findings regarding the safety of automobiles:

- . The perceived greater safety of large automobiles is an important influence in many automobile purchases at the present time.
- . A much smaller number of consumers' attempt to differentiate the safety of cars within a class. These people may rely on published material, but more often they attempt to interpret the dimensions (size) of an automobile as an indication of safety.
- . Most people assume that automobiles within a particular size class must all be equally safe. Many who make this assumption would be willing to change their minds if they received information regarding the differences within an automobile size class.
- . Even if safety differences were documented, some people would ignore them in making a selection, because of a refusal to admit personal danger or because safety characteristics are seen as important only if any accident occurs which is viewed as a statistical unlikely occurrence.

An additional finding revealed that many consumers, especially men, feel more concern for their family's safety than for themselves. This finding has obvious relevance when preparing any motivational material on safety considerations.

2. Maintenance Costs

Most participants of the groups put maintenance costs secondary to safety. The issue may appear to be less important, but some consumers perceived maintenance cost differences where they did not perceive safety differences. Thus, it appeared that maintenance costs may influence



as many car purchases as safety considerations. (This conclusion is being tested in greater detail during the ongoing national survey and supplementary group depth interviews.)

### 3. Accident Damage Repair Costs

One of the most conclusive findings from the group depth interviews was the low level of interest in accident repair costs. It is not taken into consideration when selecting an automobile. There are two reasons for this lack of interest. First, most consumers are quick to recognize that accident repair costs may be of interest to insurance companies, but have no direct impact upon the consumer's pocketbook. Second, in order to weigh accident repair costs when making a purchase decision, the consumer must fully accept the possibility that he will have an accident. Many people prefer not to consider that possibility. Furthermore, if the consumer does come around to considering the possibility of an accident, it is safety that becomes primary, not accident repairs.

### (3) Overall Reaction to the Prospect of the Ratings

The initial reaction to the ratings was one of a definite interest and a desire to consider whether the information would be useful. However, there was little tendency for an immediate wholehearted acceptance of the idea. The overall consumer reaction is discussed in the following three parts:

- . The government's role
- . Influence on purchase
- . Method of use of the rating.

#### 1. The Government's Role

The appropriateness of the government's involvement and the government's credibility as a source of the ratings were discussed in the groups. A substantial number of participants questioned the appropriateness and value of the government's developing the ratings. The feeling of disapproval was stronger among the York and Detroit participants than it was in the Philadelphia group however. This could have been due to chance (since the groups were small), or it could have reflected an ideological opposition to government activities that impact on private industry in



the case of York and a sense of identification with the automotive industry against its government "opponents" in the case of Detroit. Many other participants, however, were much more positive. For them, past actions of the government in imposing safety and air pollution standards for cars seemed appropriate. In some instances they did have reservations about particular government actions (e.g., resentment of the seat belt interlock), but they were not opposed to the idea of government involvement in automobile standards and consumer information.

With regard to the government's credibility, it was found that some people put as much or more credence in ratings from Consumer Reports or some other government consumer institution than the proposed NHTSA rating system. However, many seemed willing to assure that the government could do at least as good a job as anyone else. In particular, it was expressed that information from the government was expected to be far superior to similar information published by the manufacturers. (A major research objective of the ongoing national survey and group depth interviews is to more precisely test consumers feelings regarding the appropriateness of government involvement in automobile ratings development.)

Even though there was disagreement and ambivalence about the government's role in this area the results clearly suggested that any Title II information produced for the public should acknowledge its government origins. Whatever qualms some individuals had, they all agreed that the government's information about automobiles would be more credible than manufacturers' advertising.

## 2. Influence on Purchase

From the group sessions, a significant amount of purchase influence was observed. A number of respondents indicated explicitly an intention to use the ratings as part of the car selection process, while others, who were less explicit, revealed some tendency in that direction through their high interest.

An interesting and potentially serious pattern was also observed. Many participants were quite ready to use the rating information selectively, to support preexisting opinions. That is, if a car that a participant liked was given a "bad" rating, he would decide that "these ratings are probably not very accurate" and would dwell upon the difficulties he would expect in producing valid safety or maintenance ratings. If his favorite car received "good" ratings, he would conclude that the rating system was credible. Thus, it was suspected that some of those who said the ratings would influence purchase were saying it only because the ratings they saw favored a car they would want to buy anyway.

On balance, however, the group discussions led to the expectation that a significant amount of purchase influence will occur. Again, safety ratings were somewhat more influential than the maintenance cost ratings, and cost-to-repair accident damage had a negligible effect.

### 3. Method of the Use of the Ratings

The participants made it clear that their interests in ratings would be highest at the time they were ready to purchase an automobile. In fact, some objected that display of the ratings in the newspapers and general media would be "wasteful" since they would not be automobile shopping at the time and would hardly remember the information months or years later. As a result, many participants preferred dissemination via a booklet which they could obtain when they were ready. Despite these qualifications, it was obvious that if it were possible to present the information only to those persons who are about to purchase an automobile, communication efficiency would be maximized. However, in the absence of that possibility, it does not appear to be useless to present the information to everyone. After all, many participants who were not currently automobile shopping still took an interest in the messages during the group sessions.

(4) Evaluation of the Headlines

Three principles appear to explain much of the respondent reaction to the headlines:

- . The headlines should sound general, rather than specific
- . The headline should not be cute, or gimmicky
- . All three Title II variables should be reflected in the headline.

The clear "winning" headline stood out from the others because of its format and because it best utilized the three principles previously discussed. It read as follows:

"HOW SAFE ARE THE NEW CARS? HOW MUCH DO THEY COST TO MAINTAIN? HOW MUCH DO THEY COST TO REPAIR?"

Another important finding worthy of mention was the effect of the DOT logo. The logo was not immediately identifiable as a symbol of a government agency and was confused with the symbol of either Chrysler or Mercedes-Benz. However, once recognized it seemed to lend support to consumers belief that the ratings were developed by the government. In addition, it was suggested that highlighting of the phrase, "U.S. Government Reports" also was helpful.

(5) Content and Format of the Ratings

There was a very significant amount of feeling by the participants that valid and accurate ratings of the type presented are impossible. As they see it, when an "average" is calculated across so many unknowns, either there was "fudging" somewhere in the procedure to circumvent the problems, or the average is meaningless as a predictor of what any individual could expect to happen.

On the other hand, a very important segment of the participants showed little interest in questioning or understanding the sources of the ratings. They were ready to assume that if the government was publishing them, then they must be both valid and useful. Even some who asked sharp questions about the derivations were not dissatisfied. They were interested enough to want to understand, but were willing to accept the possibility that the ratings could be valid and useful. Two personal characteristics could be responsible for this:

- . Acceptance of authority
- . Feeling comfortable with the concepts of averages and probabilities.

One of the most important findings of the group depth interviews was the clear pattern of differences among consumers in the degree to which they wished to "understand" the ratings. The response to the format of each rating system — safety, maintenance costs and accident repair costs — is discussed below.

#### 1. Format of the Safety Ratings

The safety ratings appeared as either words or numbers, as follows:

- . "Average," "above" average, or "below" average
- . Columns using numerical crashworthiness ratings on a scale of zero to one to 100
- . "Probability of fatality or serious injury when an average accident occurs," expressed as a percentage carried to one decimal place.

Some participants focused almost exclusively on the words and they reacted to and discussed only that column, ignoring the numbers as completely as if they were not even present. When asked, they indicated that the words gave them all the detail they needed and that the numbers were boring and/or troublesome. At the other extreme, some participants focused exclusively on the numbers.



It appeared, however, that the safety version which was expressed as a probability was more acceptable to a larger group of people than the "crashworthiness score." Generally, most participants seemed to prefer a scale in which the numbers have "real," rather than arbitrary, referents. Interestingly, many who were least questioning of the authority behind the ratings and their derivations (see discussion below) preferred the "crashworthiness score." There was also a suggestion that men may have been more likely to prefer the probability version than women and women would tend more toward the "crashworthiness score."

On the issue of how detailed the ratings should be and whether or not the derivation of the ratings was and should be understandable, four consumer segments were found:

- . Those who did not care to understand the derivation and who are willing to assume that the ratings must be valid and usable, and who want gross rather than fine discriminations.
- . Those who accept the validity and usability of the ratings without being troubled about the derivations, but want fine discriminations if they are possible.
- . Those who must understand and agree with the derivations in order to be impressed, but will be satisfied with gross discriminations.
- . Those who must understand and agree with the derivations, and who want the finest possible discriminations.

## 2. Format of the Maintenance Costs Ratings

Only one format for maintenance costs was used, that of actual dollar figures for the average annual corrective and preventive maintenance. Participants had no difficulty understanding the units (dollars). However, some participants questioned whether, given all the things

that can go wrong, all the "randomness" involved in whether or not some individual part fails, the variability in owners' practices, and the variability in garage practices and charges, if meaningful and usable ratings or averages could be calculated.

While the derivation of the maintenance ratings seemed to be just as questionable and no more defensible than the derivation of the safety ratings, participants actually expressed less criticism of the maintenance ratings. It appeared that when the nature of the unit was very easily understood (dollars), their derivation somehow seemed less questionable. It, therefore, seemed that a scale expressed in familiar units was regarded as being more valid than one using unfamiliar units, even though the nature of the units has nothing to do (logically) with the validity of the scaling procedures.

Another important finding was when participants who preferred the gross scale for safety ("average," "above average," or "below average") were asked whether they would prefer such a scale for maintenance also. Almost invariably the response was "no." The respondents concluded that dollars were familiar and easily understandable.

### 3. Format of the Accident Repair Cost Ratings

For reasons that have already been described, the participants devoted very little consideration to the accident repair cost information. It aroused the same concerns about derivation as the other indices and used the same familiar units-dollars as maintenance costs.

## APPENDIX E

### APPROACH TO NATIONAL SURVEY AND ADDITIONAL GROUP DEPTH INTERVIEWS

A national survey of households and an additional series of group depth interviews are currently underway to assess the effectiveness of the four selected consumer messages. The survey plan and analyses to be conducted are described in the following sections:

- . Conduct and Analysis of National Survey
- . Conduct and Analysis of Additional Group Depth Interviews
- . Summary of Research Plan.

#### 1. CONDUCT AND ANALYSIS OF NATIONAL SURVEY

The conduct of a national interview survey involves three critical steps:

- . Establishment of the basic experimental design
- . Development of a sampling plan
- . Evaluation of the results.

Each of these steps is described in detail below.

##### (1) Experimental Design

Each of the four selected communication messages will be presented to the respondent in a 45-minute home interview. The respondent will be asked to review the materials and answer questions about their auto buying interests, intentions and related topics. The interview will be conducted in person and in the homes of the respondents. Due to government requirements and to protect the manufacturers from unjust criticism, the messages will contain alphabetical car names (e.g., car A, car B, etc.) in lieu of real car names.

## APPENDIX E(2)

The messages will be evaluated in two ways:

- . Respondents will be divided into four experimental groups and a control group. Those in an experimental group will be shown only one alternate message. They will be asked which car they would buy. The most effective message should produce the highest number of "purchase choices" of those cars that are given favorable Title II ratings.
- . Later, all respondents will be shown all four messages and asked to choose the one they prefer.

Also in the 45-minute questionnaire the respondents will be asked to:

- . Indicate preference for alternate "headlines" for the messages
- . Rate various automobile characteristics on importance to them and on the extent to which each characteristic is present in their preferred cars
- . Indicate relative interest in the three Title II variables
- . Provide general demographic and car orientation background.

### (2) Sampling Plan

Data for evaluating the impact of the four best informational communications will be collected in a national area probability survey. Based upon 1970 United States Census information, National Analysts has constructed a national, multi-stage, stratified sample. It permits the collection of data in up to 114 primary sampling units (PSU's) located across the country. The sample strata by Census region and division by zone are as follows:



## APPENDIX E(3)

<u>Geographic Region</u>	<u>Division</u>	<u>Zone I (Central Cities)</u>	<u>Zone II (Suburbia)</u>	<u>Zone III (Non-Metro)</u>	<u>Total</u>
<u>North</u>	New England	2	3	2	7
<u>East</u>	Middle Atlantic	8	9	4	21
<u>North</u>	East North				
<u>Central</u>	Central	8	8	6	22
	West North				
	Central	2	2	5	9
	South Atlantic	4	6	7	17
	East South				
<u>South</u>	Central	2	1	4	7
	West South				
	Central	4	2	5	11
<u>West</u>	Mountain	2	1	2	5
	Pacific	6	7	2	15
<u>Total</u>		38	39	37	114

Utilizing this sample, data will be collected that will be representative of the conterminous United States.

Only respondents most likely to have an interest in the automobile market will be included in the survey. This will include not only licensed drivers, but also those individuals who are entering the market for the first time and who may not have a license yet. National Analysts will screen for respondents who have recently been involved in the purchase of a new or used car within a given time period (e.g., the last two years) or who plan to buy a car in the near future (e.g., during the next two years). If the person falls into either one of these categories, he will be eligible for an interview. If more than one member of the household qualifies by these criteria, a random number procedure will be used to select the individual to be included in the sample.

Each respondent will be randomly assigned to either a treatment or control group and will be exposed to only one (or

none in the case of the control group) of the experimental messages. A sample of 500 interviews will be conducted to provide for approximately 100 respondents in each group or cell. These cell sizes are large enough for the major analyses that will involve the total sample. Some subgroup analysis (e.g., separately by sex or income) will also be conducted but, due to the smallness of the subgroup samples, will not be relied upon heavily.

### (3) Evaluation of the Results

Analysis of the data resulting from the interviews will be used to address the following objectives:

- . Evaluation of the relative impact of the three Title II variables
- . Exploration of orientation (demographic and car orientation) of those respondents who are relatively more influenced by Title II information
- . Choice of a level of specificity and detail most suitable for mass dissemination.

Due to the small sample size, however, and the artificiality in not using real car names, the research cannot be relied upon for an accurate estimate of the absolute level of impact of Title II. This will be the primary purpose of the group depth interviews discussed in the next section.

## 2. CONDUCT AND ANALYSIS OF ADDITIONAL GROUP DEPTH INTERVIEWS

To augment the results of the national survey, another round of group depth interviews will be conducted. For these sessions the four Title II messages used in the survey will be modified to show real car names and the group participants will be allowed to believe, until the end of the session, that they show real ratings.

The primary purpose of the group depth interviews will be to estimate the absolute impact of Title II on consumer choices, thus "plugging a hole" in the survey design. In addition, the results will also bear upon other major research objectives such as the relative

## APPENDIX E(5)

importance of the Title II variables, the relative impact of the alternate message forms, and the types of consumers most influenced.

A total of 20 groups will be conducted in 5 cities to cover the country geographically and to provide some representation of small and large cities and cities with and without a strong "car culture":

- . Philadelphia, Pennsylvania
- . Los Angeles, California
- . Waterloo, Iowa
- . Tampa, Florida
- . Plant City, Florida.

In each city, four groups will be conducted. Each group will be separated according to sex and to level of income.

### 3. SUMMARY OF RESEARCH PLAN

The research plan described above, which features both a personal interview survey and group interview, will attempt to provide insight into some of the following areas:

- . Segments of the population likely to be most affected by Title II information
- . The overall affect of Title II on the population-at-large
- . The relative effectiveness of crashworthiness, damage susceptibility and repairability ratings
- . The relative effectiveness of each experimental message.





EVALUATION OF  
TITLE II MESSAGES

- Group Depth Interviews  
and National Survey -

Prepared for:  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

By:  
National Analysts

November, 1975

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## I. INTRODUCTION

The research reported here had the following primary objectives:

- To estimate the amount of effect government-published ratings of automobile safety, accident damage susceptibility, and maintenance costs (Title II information) might have upon consumer choices of car.
- To establish the form in which the ratings might be presented so as to have the maximum effect.
- To relate the ratings' effect to characteristics of consumers.
- To establish the relative importance of the three Title II variables.

### A. The Survey

A total of 501 usable interviews were conducted, with a national area probability sample of people who either bought a car within the past two years or intend to buy one within the next two years. These interviews proceeded with a structured questionnaire.

In the most important sections of these interviews, respondents were shown simulated versions of the Title II ratings and were asked a series of questions about them. The "messages" shown to the respondents are shown on the following pages.

	Overall Length (Inches)	Overall Weight (Pounds)	Wheel Base (Inches)	Overall Width (Inches)
Small Cars				
A	187	2,939	103	70.5
B	196.7	3,416	111	72.2
C	194.1	3,050	108	71.8
D	170.3	2,775	96	70.6
Intermediate Cars				
E	209.2	3,323	116	73.6
F	213.6	4,186	114	73.3
G	208.9	3,700	117	73.6
H	215.8	3,770	117	73.6
Large Cars				
I	223.9	4,502	121	73.5
J	222.7	4,318	121.5	73.5
K	219.9	4,400	122	73.9
L	226	4,643	123.4	73.6

### Explanations:

**Overall Length:** Total length in inches from front bumper to rear bumper.

**Overall Weight:** Total curb weight when car leaves factory.

**Wheel Base:** Total inches from the rear axle to the front axle.

**Overall Width:** Total width in inches from front bumper left side to front bumper right side.

**Cylinders:** Total number of piston chambers of the engine.



	E.P.A. Mileage	Gas Tank Capacity	Number of Cylinders	Suggested Retail Price
Small Cars	A	13	6	\$2,906.00
	B	21	4	2,907.00
	C	16	6	2,988.00
	D	21	4	2,483.00
Intermediate Cars	E	22	8	\$3,303.00
	F	26.5	8	3,333.00
	G	23	8	3,212.00
	H	25.5	8	3,413.00
Large Cars	I	24.2	8	\$4,816.00
	J	26.0	8	4,344.00
	K	26.5	8	4,752.00
	L	25.8	8	4,695.00

### Explanations:

**E.P.A. Mileage:** U.S. Environmental Protection Agency findings based on dynamometer tests simulating a number of different open highway driving conditions.

**Suggested Retail Price:** Manufacturer's suggested retail price. These are basic "sticker prices" including new car dealer preparation and transportation charges but do not include any options.

	Safety	Accident Repair	Maintenance Cost
	Likelihood of Fatal or Incapacitating Injuries Per Year (Accident Rate X Injury Rate Per Accident)	Annual Cost to Repair Crash Damage	Average Annual Maintenance Cost
Small Cars			
A	.94%	\$63	\$175
B	.70%	\$77	\$210
C	1.11%	\$73	\$130
D	.89%	\$84	\$140
Intermediate Cars			
E	.64%	\$60	\$160
F	.33%	\$62	\$250
G	.52%	\$50	\$170
H	.47%	\$67	\$190
Large Cars			
I	.22%	\$48	\$480
J	.18%	\$90	\$200
K	.27%	\$73	\$260
L	.16%	\$52	\$540

## Explanations

**Safety:** Through analysis of thousands of police and insurance company accident reports on these cars, two safety aspects were established for each make of car. First, the likelihood that the car will be in an accident if driven an average number of miles per year was established. In this analysis, driver characteristics were "held constant" statistically, so we have the likelihood that the car will be in an accident if driven by the average driver for an average number of miles per year.

Second, the likelihood or probability that a fatal or incapacitating injury will occur if an accident does happen was established. If we multiply the car's likelihood of being in an accident by the likelihood of fatal or incapacitating injury if an accident does occur, we have the likelihood of fatal or incapacitating injury if you drive or ride in this car. These numbers are shown in the tables, as percentages.

**Accident Repair:** From thousands of reports in the files of insurance companies and state motor vehicle departments, the average cost to repair the accidents for each make of car was established. Accidents costing under \$100 to repair were omitted from the calculation, because for instance, a car with a good bumper system may sustain no damage in a low speed crash while a car with a poor bumper system may sustain some damage in the same crash. If we include these accidents, the first car will look bad because it has no low-cost accidents to pull down its average. Omitting accidents under \$100 from consideration avoids this problem.

The average cost to repair the accident for each make of car was multiplied by the car's likelihood of being in an accident (the same accident likelihood that was used in the safety ratings) to produce the numbers in the table. These numbers are, therefore, the approximate accident repair cost, projected to an annual figure, that can be expected by the average driver who drives an average number of miles.

**Maintenance Cost:** For each make of car, the annual cost in parts and labor of carrying out the manufacturer's recommendations for preventive maintenance was established. Such things as oil changes, tune-ups, and wheel rotation were covered. An average number of miles driven was assumed. Standard flat rate manuals were used to indicate parts and labor costs.

For corrective maintenance, the "failure rate" of each car's parts was established, through records kept by drivers and by garages. For example, it was established that fuel pumps fail on an average of once every 12,000 miles for one of the cars. It was also established that the average cost for fuel pump replacement on this car is \$38, for parts and labor. Thus, fuel pump replacement cost, projected annually for the average driver (12,000 miles per year) is  $\frac{12,000}{42,000} \times \$38 = \$10.86$ .

Repeating this procedure for many other parts and systems, and adding the results, established an expected annual cost for corrective maintenance.

The table shows the sum of preventive maintenance and corrective maintenance.

## Explanations

**Safety:** Through analysis of thousands of police and insurance company accident reports, the number of fatal or incapacitating injuries was related to the number of accidents. Thus, the table shows the likelihood, stated as a percentage, that there will be a fatal or incapacitating injury if an accident occurs.

**Accident Repair:** From thousands of reports in the files of insurance companies and state motor vehicle departments, the average cost to repair the accidents for each make of car was established.

Accidents costing under \$100 to repair were omitted from the calculation, because a car with a good bumper system may sustain no damage in a low speed crash while a car with a poor bumper system may sustain some damage in the same crash. If we include these accidents, the first car will look bad because it has no low-cost accidents to pull down its average. Omitting accidents under \$100 from consideration avoids this problem.

**Maintenance Cost:** For each make of car, the annual cost in parts and labor of carrying out the manufacturer's recommendations for preventive maintenance was established. Such things as oil changes, tune-ups, and wheel rotation were covered. An average number of miles driven was assumed. Standard flat rate manuals were used to indicate parts and labor costs.

For corrective maintenance, the "failure rate" of each car's parts was established, through records kept by drivers and by garages. For example, it was established that fuel pumps fail on an average of once every 42,000 miles for one of the cars. It was also established that the average cost for fuel pump replacement on this car is \$38 for parts and labor. Thus, fuel pump replacement cost, prorated annually for the average driver (12,000 miles per year) is  $\frac{12,000}{42,000} \times \$38 = \$10.86$ .

Repeating this procedure for many other parts and systems, and adding the results, established an expected annual cost for corrective maintenance.

The table shows the sum of preventive maintenance and corrective maintenance.

Because estimates of part failure rates are necessarily imperfect, the maintenance costs are shown as a range instead of a single number.

	Safety  Likelihood of Fatal or Incapacitating Injury if an Accident Occurs	Accident Repair  Average Cost to Repair an Accident (Over \$100)	Maintenance Cost	
			Average Annual Maintenance Cost	
Small Cars	A	\$475	\$151-200	
	B	\$500	\$201-250	
	C	\$480	\$101-150	
	D	\$515	\$151-200	
Intermediate Cars	E	\$480	\$151-200	
	F	\$530	\$251-300	
	G	\$470	\$201-250	
	H	\$560	\$201-250	
Large Cars	I	\$500	\$451-500	
	J	\$490	\$451-500	
	K	\$570	\$351-400	
	L	\$600	\$501-550	

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	Safety Relative Frequency of Fatal or Serious Injuries When Accidents Occur	Accident Repair Ranking for Economy of Accident Repair	Maintenance Cost Ranking for Economy of Maintenance
Small Cars	A 138 B 102 C 151 D 134	1 6 4 8	5 7 1 2
Intermediate Cars	E 98 F 79 G 86 H 82	3 9 2 10	3 8 4 6
Large Cars	I 62 J 59 K 68 L 54	5 12 11 7	11 10 9 12

### Explanations:

**Safety Ratings:** Cars with high numbers are more likely to involve deaths or serious injuries when they have an accident than cars with low numbers. 100 is the average for all cars.

**Accident Repair:** Using insurance company and police files, the makes of cars were ranked on the average cost to repair an accident. The lower the number shown, the less expensive the car is to repair after an accident, on the average.

**Maintenance Cost:** From records kept by drivers and garages, average annual maintenance cost (preventive and corrective maintenance) was established. The lower the number shown, the less expensive the car is to maintain, on the average.



### Where did these ratings come from?

The National Highway Traffic Safety Administration was empowered by the U.S. Congress in 1972 to determine the safety and maintenance and repair costs of cars on the market.

Government-sponsored research now tells you which cars are average and which are above and below average on safety, accident repair costs, and maintenance costs. This

information is based on the work of scientists and engineers who crash-tested cars and consulted thousands of records kept by insurance companies, police departments, state motor vehicle departments, garages, fleet operators of cabs, and individual motorists. After mathematical and computer-based analysis, the following findings are available.

	Safety	Economy of Accident Repair	Economy of Maintenance
Small Cars			
A	Below Average	Average	Above Average
B	Below Average	Average	Below Average
C	Below Average	Average	Above Average
D	Below Average	Below Average	Below Average
Intermediate Cars			
E	Average	Average	Average
F	Average	Average	Average
G	Average	Average	Average
H	Above Average	Below Average	Average
Large Cars			
I	Average	Average	Average
J	Above Average	Average	Below Average
K	Above Average	Above Average	Above Average
L	Above Average	Above Average	Average



All respondents were shown Cards 1 and 2. They were also shown either Cards 3A, 3B, 3C, 3D, or no Card 3 at all. Following presentation of the information, respondents were asked which of the cars they would buy.

Then, all respondents were shown all four versions of Card 3, and were asked to rank-order them on their appeal.

Respondents also rank-ordered the three Title II rating variables on potential to influence their car purchasing.

The remainder of the questionnaire existed primarily as information to be examined in relationship to the key questions described above.

During the course of the interviewing it was discovered that the eligibility rate (i.e., the proportion of the population who said they bought a car within the past two years or intended to buy one within the next two years) was lower than expected. As a result, it was necessary to increase the interviewers' assignments. Assignments were increased selectively, in those geographic segments where eligibility rates were running relatively high. A weighting system restored geographic balance to the sample.

The omission of real car names from the Title II messages is a serious limitation. It made the respondents' choices of a car from the material shown them an abstract, hypothetical issue. For example, the survey does not establish whether a favorable Title II rating could overcome allegiance to a different make, or unattractive styling, to name just two factors known to be important in car selection.

Because of this limitation, the survey did not appear highly appropriate for establishing the magnitude of the effect that Title II might have upon car selections. That is, with the messages to be shown such an abstract simulation of the context in which car choices are made in the real world, the survey did not appear to be a good predictor of how many people would use real Title II ratings to make real car choices.

On the other hand, the survey did appear appropriate for studying two other issues: the relative importance of the Title II variables, and the relative effectiveness of different methods of presenting the Title II information.

Because the study of the relative importance of the Title II variables seemed especially appropriate for the survey, the Title II messages that were used were developed to serve this objective. Specifically, cars within a size class with the most favorable safety ratings were assigned the least favorable maintenance ratings, and vice versa. In this way, respondents were forced to reveal, in their choice of a car, which variable was more important; had they been offered a car with very good ratings on both, this information would have been lacking. (Information on accident damage susceptibility was not treated so systematically; previous research had indicated clearly its relative unimportance.)

Assigning the ratings as described made the survey still less appropriate as a vehicle for studying the overall magnitude of Title II's effect, since in the real world its greatest effects should come with cars that are favorably rated on all the variables, when compared with their size class competitors.

#### B. Group Depth Interviews

Twenty group depth interviews were conducted in Philadelphia, Los Angeles, Waterloo (Iowa), Tampa, and Plant City (Florida). In each city, four groups were convened -- high income men, high income women, low income men, and low income women.

Group participants were shown four versions of the Title II ratings, as well as two other information sheets used to establish a context in some of the groups. This material was identical to that shown on pages 2 through 7, except that in the group depth interviews real car names were used instead of the alphabetic designations shown in the exhibits used for a survey. Participants were led to believe, until the end of the sessions, that the ratings were genuinely applied to the cars named.

Each group depth interview lasted about two hours, and included about seven or eight consumers. The sessions were moderated by a member of National Analysts' psychologically trained staff. The group depth interviews covered the points listed above as the research objectives.

The sessions were tape recorded, and those recordings were intensively analyzed in the preparation of this report.

From the consideration of real cars, and the advantage of probing by skilled moderators (e.g., "Would it really influence you? What if your favorite car had a low rating?"), the group depth interviews were intended to compensate for some of the survey's weaknesses in estimating the overall magnitude of Title II's effects. They also pursued some specific issues that were not addressed in the survey.

Of course, group depth interviews have their own limitations. The number of respondents is still relatively small, there is no scientific sampling plan, and conclusions are based upon the interpretation and judgment of analysts working qualitatively, without recourse to the documentation of statistical analysis.

When the group depth interview and survey results are consistent, as they are in many cases, confidence in the conclusions derived is increased. Even then, it should be recognized that proof, in the strictest scientific sense of incontrovertible evidence, is not applicable to many of the conclusions presented. Those conclusions represent the best judgments, drawn from all the evidence available, of experienced market researchers.

## II. THE MAGNITUDE OF TITLE II'S EFFECT

As explained above, the group depth interviews were intended as the major source of information about the magnitude of Title II's effect.

The most certain conclusion from the group depth interviews is that Title II ratings will have some effect on car selection and purchase. Many of the group depth interviews convincingly maintained, in the face of probing by the moderator, that they would pay attention to Title II ratings and that their choice of a car would be influenced. In many of the group sessions, a majority of the participants maintained this position.

It is logical to assume that the group depth interview participants were overstating Title II's effect. Being influenced by safety and maintenance costs is, after all, such a patently desirable thing that many people would find it difficult to admit that they would ignore such ratings. Certainly it is easier to say Title II ratings would be an influence than to act on such ratings in the face of competition from such factors as brand allegiances and styling.

The participants themselves pointed out that the effect of Title II ratings would depend upon how specific cars were rated. When consumers find two cars almost equally attractive and desirable, and one car is rated very favorably and the other very unfavorably on all the Title II variables, the ratings would almost inevitably have a major effect. But consumers who are not otherwise attracted to any of the favorably rated cars, or who encounter a pattern of high and low ratings on the cars they like, are necessarily much less certain in predicting their own responses.

The actual Title II ratings of specific cars have not even been developed yet, of course. Therefore, no research methodology could predict with confidence precise quantitative levels of impact of Title II upon car selections. Certainly the group depth interviews do not permit great precision in quantitative prediction.



However, we at National Analysts developed an understanding of the order of magnitude of the effect we would expect from Title II ratings. This understanding was derived from the group depth interviews, but it naturally relies also upon our background of experience in consumer and market research. Because of that background, we have some feel for the nature of car purchasing decisions and the strength of competing considerations in the decision. More generally, our experience with consumers in group depth interviews gives us some understanding of how strongly a group depth interview participant must maintain a position before we are willing to assume it is genuine enough to affect his behavior.

From this background we have interpreted the group depth interviews to conclude that Title II ratings will probably affect a minority of car selection decisions, but that minority will be a significant or even substantial one. In other words, we believe that more than five or ten percent, but less than forty or fifty percent, of decisions will include Title II ratings as significant input, especially as ratings become available for more and more cars.

From the evidence at hand, no more specific prediction can be offered. Indeed, given the fact that the Title II ratings have not yet been developed, so that their range of differences and their application to specific cars are unknown, it is unlikely that any form of market research could offer much more precision in estimation. Furthermore, predicting consumer response to an offering unfamiliar to them is not an exact science even when all the characteristics of the offering can be specified in detail.

As expected, the results of the survey are of little or no help for predicting the overall magnitude of Title II's effect. Each participant chose a car from a list of twelve, designated "A" through "L", after having seen one version or no version of Title II information about the cars. Since there were four versions of the Title II information, plus one group of respondents who saw no version, five groups of respondents exist. A chi-square test showed that the differences among the five groups in their car choices were not statistically significant at any accepted confidence level. Furthermore, differences between each experimental group taken singly



(i.e., those who saw one particular Title II version) and the control group (i.e., those who saw no Title II information) were not statistically significant by the chi-square test.

As always, failure to reach statistical significance is not evidence that differences do not exist. In this case, it merely means that the survey does not prove Title II will have an effect -- but neither is it disproved.

As discussed earlier, the assignment of Title II ratings used in the survey to the simulated cars was done in a way that would tend to reduce the magnitude of Title II's effect -- no car was highly rated on all the Title variables, or even on safety and maintenance. This, plus the relatively small sample size and the inability to use real car names, meant that the survey was not suitable as a major source of information on the magnitude of the effect.

Thus, the conclusion from the group depth interviews, as stated above, must stand as our best prediction about the magnitude of Title II's influence on car choices.

### III. THE NATURE OF THE EFFECT - CAR TYPE VS. CAR MODEL

Table 1 shows the percentages of the survey respondents choosing each of the simulated cars, following their exposure to the information presented earlier in this report, in Cards 1 and 2 and the Title II information presented according to the schedule that has been described. Thus, for example, 6% of those who saw Title II version 3A chose car E, 19% of those who saw 3B chose car E, etcetera.

The table shows subtotals for those choosing small, intermediate, or large cars. For example, 47% of those who saw 3A chose car E, F, G or H, which were the intermediate size cars. With only a few exceptions, the percentages of the experimental groups who saw Title II ratings, choosing a class of car are not very different from the percentage of the control group, who saw no Title II ratings, choosing that class. This finding would be consistent with a conclusion that the Title II information had little effect upon the type of car chosen.

Table 2, based on the same data as Table 1, is percentaged within car type. That is, for example, of those respondents who saw Title II version 3A and chose car E, F, G or H, 13% chose E.

Table 2 seems to indicate large differences between the experimental groups and the control group. If so, when considered along with Table 1, it would indicate that, while Title II information had little effect on the choice of a car type, it did have an effect on the choice of a specific car within the type.

However, there are reasons to be cautious about such an interpretation from Table 2 alone. First, the subsample sizes on which the table is based are small. For example, only 115 respondents (unweighted) saw version 3A, and of these, only 31 chose one of the four small cars. Thus, to pursue this example, the first four percentages in the

Table 1

Purchase Intention after Seeing Information,  
by Form of Title II Information Shown

- Percentaged across Car Types -

	<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>3D</u>	<u>None</u>
<u>Small Cars</u>					
A	3	2	1	2	3
B	4	4	10	2	9
C	6	5	8	9	7
D	<u>9</u>	<u>4</u>	<u>14</u>	<u>11</u>	<u>8</u>
	22%	15%	33%	24%	27%
<u>Intermediate Cars</u>					
E	6	19	10	7	3
F	14	18	4	11	12
G	7	6	11	9	6
H	<u>20</u>	<u>18</u>	<u>10</u>	<u>12</u>	<u>20</u>
	47%	51%	35%	39%	41%
<u>Large Cars</u>					
I	4	6	11	3	7
J	9	10	7	6	6
K	12	10	4	14	15
L	<u>6</u>	<u>8</u>	<u>10</u>	<u>13</u>	<u>5</u>
	31%	34%	32%	36%	33%

Table 2

Purchase Intention after Seeing Information,  
by Form of Title II Information Shown

- Percentaged within Car Types -

	<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>3D</u>	<u>None</u>
<u>Small Cars</u>					
A	14	12	2	9	12
B	19	29	30	9	33
C	25	33	25	35	24
D	<u>42</u>	<u>25</u>	<u>43</u>	<u>47</u>	<u>30</u>
	100%	100%	100%	100%	100%
<u>Intermediate Cars</u>					
E	13	18	27	18	8
F	30	36	12	29	29
G	16	12	31	22	14
H	<u>42</u>	<u>35</u>	<u>29</u>	<u>31</u>	<u>49</u>
	100%	100%	100%	100%	100%
<u>Large Cars</u>					
I	12	19	34	8	21
J	31	29	23	18	18
K	39	29	14	39	46
L	<u>18</u>	<u>23</u>	<u>30</u>	<u>35</u>	<u>15</u>
	100%	100%	100%	100%	100%

first column of Table 2 are based on 31 unweighted respondents.\* Thus, differences in Table 2 are more readily due to chance fluctuations than the subtotals shown in Table 1. Second, an examination of Table 2 does not show consistent differences across the experimental groups. For example, compared to the control group more of group 3B but fewer of group 3C chose car F, even though car F had the same relative position on the Title II ratings in messages 3B and 3C.

However, it is not necessary to rely solely upon these tables. The group depth interview participants maintained very convincingly that the Title II information would not affect their decision as to a size of car, but could affect decisions within a class. Furthermore, they offered a convincing explanation for this effect. They have always believed or known, they said, that large cars are safer and that small cars cost less to maintain. Their preferences and decisions have already been taking these relationships into account. Therefore, since the Title II information shown them merely confirms relationships they have already been taking into account, it would have no additional affect upon their car type decisions.

There is an additional reason, not suggested directly by the research but following from logical considerations, to conclude that Title II will have a greater net effect on choices within classes than on choices of a class. It appears that as Title II ratings are developed, cars that are larger will tend to have better safety ratings but poorer maintenance ratings than smaller cars. If so, they will tend to "cancel" each other. If some consumers stress safety and are moved toward larger cars by Title II, while others stress maintenance and are moved toward smaller cars, the net effect of Title II upon car type choice is reduced.

But even apart from this distinction between individual effects and net effects, the group depth interviews point in the same direction as the survey results: it appears that Title II ratings will affect the choice of a car within a class more than the choice of a class.

---

\*The tables shown in this report show percentages but not numbers of respondents, because the weighting procedure used makes those numbers misleading. Approximate numbers can be derived from the tables by remembering that the sample of about 500 was split into approximate fifths by the experimental procedure.



#### IV. RELATIVE IMPORTANCE OF THE TITLE II VARIABLES

Following the experiment in which the survey respondents chose a car after most of them had seen Title II information, they were asked which of the three Title II variables would most influence them if the ratings were shown them. The results are in Table 3.

Clearly, safety and maintenance are both more important than accident repair costs. The relationships are the same regardless of which Title II version the respondents worked with.

Some information bearing upon this issue can be extracted from Table 2, shown in Chapter III. Through reference to the exhibits shown in the first chapter, it can be seen that, within the car classes, the car given the best safety rating was given the poorest maintenance rating, and vice versa. There are exceptions: version 3D sometimes made no distinctions within a class, because of the nature of this format, and in version 3A car J was given the most favorable maintenance rating instead of car K, which had the poorest safety rating within the class and had the best maintenance rating in versions 3B and 3C.

At any rate, for each of the experimental groups the car with the best safety rating within the class and the car with the best maintenance rating within the class can be identified. To choose the safest car within the class the respondent had to accept the fact that he was choosing the car with the highest maintenance cost, and vice versa (with the exceptions noted above). Examination of the choices could, therefore, shed some light on the relative importance of the variables.

Among those respondents choosing a small car, car B, which had the best safety rating and the poorest maintenance rating, was chosen by fewer people in the experimental groups than in the control group. In other words, the effect of introducing Title II ratings in versions 3A, 3B or 3C was to reduce the choice of this car. On the other hand, the choice of car C, with the best maintenance and poorest safety rating, increased in version 3B and stayed the same in 3A and 3C. It would appear, therefore, that maintenance was more important than safety to the small car buyers as a group.

Table 3

Percent Ranking First Each of  
the Title II Variables

	<u>Total Sample</u>	<u>Title II Information Shown</u>				
		<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>3D</u>	<u>None</u>
Safety	68	72	69	65	67	65
Accident repair	2	1	3	1	2	0
Maintenance	<u>30</u>	<u>26</u>	<u>28</u>	<u>34</u>	<u>31</u>	<u>35</u>
	100%	100%	100%	100%	100%	100%

Among those selecting an intermediate car, car E, rated best on maintenance and worst on safety, was chosen by more in the experimental groups than in the control group, while car F, with the best safety but poorest maintenance rating, was increased in 3B, stayed the same in 3A, and decreased in 3C. Again, maintenance appears to be more important.

Among those selecting a large car, the comparison is clearest for versions 3B and 3C. Here, the choice of car L, with the best safety rating and worst maintenance rating, was higher in the experimental groups, while the choice of car K, with the best maintenance and worst safety ratings, was lower in the experimental groups.

The analysis above is based upon small subsamples, of course, and this fact, plus the limitations of the experiment that have been discussed make it less than fully conclusive. However, it is not inconsistent with the results from the group depth interviews.

Participants in the group depth interviews virtually ignored the ratings on accident damage repair costs. Many of them saw very quickly that this information is of little concern to them, since accident damage is covered by insurance. Probing did not reveal any tendency to make any other use of the rating, either. For example, the participants did not make the extension to concluding that cars with favorable ratings on this variable might suffer less of the unsightly minor nicks and scrapes that often are not repaired.

The group depth interview results did not offer an entirely clear choice between safety and maintenance. Many participants indicated, naturally, that they would hope to find a car they liked that was favorably rated on both variables. In the absence of that, there was disagreement among the participants as to which would be more influential, and some vacillation by individuals. On balance, we interpreted the group depth interview results as indicating that safety ratings would have somewhat more net influence than maintenance ratings, but that the margin would not be overwhelming.

Table 3, on the other hand, did show a large difference between safety and maintenance, with safety said to be more important by a clear majority of the survey respondents.

It is plausible to assume that safety is a more socially acceptable response to the survey question than maintenance. Might not many people be unwilling to "admit" that they could be more influenced by monetary considerations than by the safety of themselves and their families?

This process by which people went from the generalization that one's life is more important than one's pocketbook to the assertion that Title II safety ratings would influence them more than maintenance ratings was directly observed in the group depth interviews. In many cases, it was only after probing by the moderator that participants opened up to the possibility that maintenance ratings might actually influence them more.

Thus, we are inclined to discount the large difference between safety and maintenance shown in Table 3.

Our conclusions, weighing all the evidence available, are as follows: It seems nearly certain that accident damage repair will have little influence. Both safety and maintenance will be important, with safety the highest, but the difference between them may not be large. With less confidence, it appears that safety ratings may be relatively more important among large car buyers and maintenance ratings among small car buyers.



## V. COMPARISON OF THE FOUR VERSIONS OF TITLE II MESSAGES

After the experiment in which respondents made a car choice, they were shown all four versions of the Title II messages (as reproduced in the exhibits shown in the first chapter) and were asked which one would be most likely to make them pay attention and use the ratings. Table 4 shows these results.

Version 3B is a clear favorite by this measure. Only in the control group was it not the first choice of a plurality. In all four experimental groups, who had had the experience of working with the Title II ratings, 3B was chosen by more people than chose any of the others.

In principle, Tables 1 and 2, shown earlier, bear upon this issue. However, it has already been pointed out that differences based on the data in these tables are not statistically significant, so that interpretation from those tables should be cautious and, preferably, should be joined with corroborative evidence.

From Table 1, taking the Title II versions one at a time, the difference between the percentage of respondents choosing a car and the percentage of those who saw no Title II information was established. The sum of these differences is a measure of how different the choices of the two groups were. This procedure, of course, "counts respondents twice": if a given respondent who would otherwise have chosen car F saw the Title II information and chose car G instead, he reduced the frequency for F and increased the frequency for G. Therefore, one-half of the sum described above is a crude measure of Title II's effect, if we assumed that the only difference between the control group and the experimental groups is the presence of Title II information. (That assumption is not wholly defensible, because of the small sample sizes, of course).



Table 4

Percent Banking First Each of the  
Title II Information Forms

	<u>Total Sample</u>	<u>Title II Information Shown</u>				
		<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>3D</u>	<u>None</u>
3A	28	27	27	25	33	30
3B	34	36	38	38	36	22
3C	17	19	17	16	16	19
3D	<u>20</u>	<u>20</u>	<u>18</u>	<u>22</u>	<u>15</u>	<u>30</u>
	100%	100%	100%	100%	100%	100%

At any rate, the procedure described above derives the following percentages:

3A	11.5%
3B	24.5%
3C	30.5%
3D	21.0%

By this reckoning, version 3C had the largest effect upon car choices. However, there are reasons, described above, to question the analysis. In fact, if the procedure is applied separately to the three classes of cars in Table 1, version 3D had a greater effect among the small car purchasers, with version 3C leading the other two classes. It is at least as plausible to regard this as evidence of unsystematic fluctuations in the data as of a genuine differential effect.

This issue was explored intensively in the group depth interviews. The majority of the participants preferred the formats that gave them more detail (i.e., they preferred 3A or 3B over 3C or 3D). Many seemed convincing as they maintained that such gross ratings as 3C or 3D would not influence them.

On this issue, the group depth interviews should probably be given considerable weight. The group depth interview participants were presented with ratings showing real car names. In the real world, the Title II ratings will be competing with such bases for choosing a car as brand allegiance and styling, and it is inevitable that in many cases the car a consumer prefers on grounds such as these will not have the most favorable Title II ratings.

Versions 3C and 3D look like they could be an expression of opinion, perhaps subjectively based. A consumer can say, rather simply, "I don't agree with that opinion. In my opinion, my favorite car is very safe." In other words, he is not discouraged from setting his opinions against those in the ratings.

Versions 3A and 3b, with their presentation of actual numbers, may make it harder for the consumer to rationalize the ratings away. He can still maintain that they are wrong, of course, but he cannot dispose of them so neatly as being "just somebody's opinion".

Such considerations as these appear to be involved in the group depth interview participants' position that the greater detail in 3A and 3B would be more likely to influence them.

Rather conclusively, more of the group depth interview participants preferred 3B than preferred 3A:

- 3A was extremely difficult to understand, especially in its safety rating. Using a single number to express the joint effect of the likelihood of having an accident and the likelihood of death or injury if an accident does occur strained the comprehension of nearly all the participants.
- When the nature of 3A's safety rating was explained, laboriously and at length, so that the participants understood it, they tended to reject it. In the view of many of them, it is simply not possible to take accident likelihood into account, since accidents depend upon drivers more than cars. In other words, the assertion in message 3A that driver characteristics were controlled statistically did not seem very credible. The participants preferred to be told what will happen if an accident occurs, since the likelihood of that occurrence is not in the hands of the car manufacturer, they believe.
- Participants also tended to prefer 3B's version of the maintenance over that in 3A. Specification of a range of dollars instead of an exact amount seemed to them an appropriate recognition of the fact that the ratings deal in averages and that no individual car owner could expect his own experience to agree exactly with the rating.

Weighing all the evidence, we conclude that consumers prefer, and are more likely to be influenced by, Title II ratings that present numbers with real referents (i.e., real things being counted, such as dollars or fatalities) rather than arbitrary scale numbers. The safety rating should summarize accident outcome without dealing with likelihood of having an accident. Of the four test versions developed, 3B is the most appropriate.

## VI. TITLE II ISSUES AND DEMOGRAPHIC CHARACTERISTICS

The research results did not isolate any particular demographic segments as being especially influenced by Title II ratings. The absence of such results is not, of course, a demonstration that no such relationships exist, given the necessary limitations of the research:

- The number of survey respondents available, marginal at best, becomes even smaller when the sample is split into demographic groups. This, plus the imprecision of the experiment that was a major part of the survey, makes generalization from these results questionable.
- Group depth interviews are more useful for generalizing about consumers as a whole than for pinpointing demographic effects. Although the analysis did attempt to isolate demographic relationships, no such relationships emerged.

In other words, an experiment on car choice that used real car names, and had a larger sample size, might have produced evidence of demographic relationships. The present results, therefore, should be viewed as inconclusive, and not as evidence that demographic relationships with Title II effects do not exist.

While conclusive results were not obtained, the survey data do support one intriguing hypothesis, which is discussed after the presentation of the tables of demographic characteristics to follow. Those tables also examine the choice of a Title II version.

### A. Sex

Table 5, showing the car choices in the experiment according to the sex of the respondent, is included for reference. Theoretically, the table can be interpreted by examining the choices of men in the experimental groups and in the





control group, and women in the same way, and then relating any differences to the Title II ratings of the cars as shown earlier in the exhibits. However, since these data did not reach statistical significance when the sex difference was ignored, as reported earlier, and since cell sizes are even smaller when the respondents are split by sex, such an analysis does not seem appropriate.

Table 6 suffers from similar defects, but since it restricts tabulation to the type of car chosen, it may be more interpretable.

In the control group, as shown in Table 6, women were more often attracted to large cars and men to small cars. Among the men, the experimental groups were less attracted to small cars and more attracted to large cars than the control group. Among the women, the attraction to larger cars seems less in most of the experimental groups than in the control group.

One way of viewing the pattern just presented is to suggest that the Title II information moved to reduce the differences between men and women in car type preferences.

Another suggestion from this analysis would be that men were more impressed by the safety information, shifting toward larger cars, and women by the maintenance information, shifting toward smaller cars. However, Table 7 shows the respondents' own direct report on which variable was more important: here, more women than men said safety was the most important variable.

The two findings are not necessarily in direct conflict: women could be more interested in safety, as in Table 7, and have that greater interest reduced but not eliminated by Title II information.



Table 7Percent Ranking First Each of the  
Title II Variables, by Sex

	<u>Total</u>	<u>Men</u>	<u>Women</u>
Safety	68	61	80
Accident repair	2	2	1
Maintenance	<u>30</u>	<u>37</u>	<u>19</u>
	100%	100%	100%



## B. Age

As with sex, Table 8 is presented for reference, without interpretation, because of the very small cell size.

Table 9, showing the choice of a type of car by age, shows more younger people choosing smaller cars and older people choosing larger cars in the control group. In the experimental groups this difference, while still present, was usually smaller, which could indicate that younger people were more moved by the safety ratings and older people by the maintenance ratings.

Table 10 shows that younger people were more likely to say maintenance was the most important variable, and older people to name safety. Again, there is not necessarily any conflict between Tables 9 and 10. Table 10 seems to be one explanation for the pattern of car type choices shown in Table 9's control group; the experimental groups in Table 9 tended to show the same pattern but to a lesser extent.

## C. Income

Table 11 is shown for reference, without comment.

Table 12, shows, unsurprisingly, that people with more money much more often chose large cars. Again, the relationship appears to be smaller in the experimental groups than in the control group.

Table 13 shows no meaningful relationship between income and which variable was said to be most important.

## D. Summary of Title II Effects and Demographic Characteristics

No attempt to relate demographic characteristics to the magnitude of the Title II response.

Table 8

Purchase Intention after Seeing Information, by Form of  
Title II Information Shown and Age

- Percentaged within Car Types -

	3A			3B			3C			3D			None		
	Under 30	30-49	50 and over	Under 30	30-49	50 and over	Under 30	30-49	50 and over	Under 30	30-49	50 and over	Under 30	30-49	50 and over
<u>Small Cars</u>															
A	45	-	-	12	15	-	4	-	-	10	6	12	12	14	-
B	9	27	20	50	23	-	17	58	22	10	-	25	29	43	-
C	27	20	30	25	38	33	26	25	22	30	38	38	24	21	50
D	18	53	50	12	23	67	52	17	56	50	56	25	35	21	50
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<u>Intermediate Cars</u>															
E	3	26	10	12	-	37	24	45	21	10	19	38	14	-	-
F	48	15	20	42	46	23	5	18	7	35	22	38	21	41	25
G	10	22	15	12	12	10	43	9	36	10	30	25	14	18	-
H	38	37	55	33	42	30	29	27	36	45	30	-	50	41	75
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<u>Large Cars</u>															
I	-	19	18	-	17	25	36	47	14	-	11	10	22	25	8
J	29	19	55	67	28	19	9	21	36	17	32	5	11	19	25
K	50	48	-	33	31	25	9	16	14	58	21	45	56	44	42
L	21	14	27	-	24	31	45	16	36	25	37	40	11	12	25
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%



Table 10

Percent Ranking First Each of the  
Title II Variables, by Age

	<u>Total</u>	<u>Under 30</u>	<u>30- 49</u>	<u>50 and Over</u>
Safety	68	60	69	78
Accident repair	2	2	1	0
Maintenance	<u>30</u>	<u>38</u>	<u>30</u>	<u>22</u>
	100%	100%	100%	100%







Table 13

Percent Ranking First Each of the  
Title II Variables, by Income

	<u>Total</u>	<u>Under \$7,500</u>	<u>\$7,500- \$14,999</u>	<u>\$15,000 and Over</u>
Safety	68	71	67	67
Accident repair	2	2	1	2
Maintenance	<u>30</u>	<u>27</u>	<u>33</u>	<u>31</u>
	100%	100%	100%	100%

The data that have been presented do suggest one interesting hypothesis. Demographic relationships with car type preferences appear to exist. In some cases, these preferences are related logically to the Title II variable said by the respondents to be of the greatest importance. The presentation of Title II ratings may serve to diminish the demographic relationships with car type choice.

Because of the scanty nature of the data, this interpretation is labelled on hypothesis rather than a conclusion. However, it is not implausible. Demographic relationships with car type choice could reflect a tendency for different demographic segments to have paid selective attention to car characteristics. Perhaps, for example, men paid more attention to maintenance costs, and thus more often favored smaller cars, because they more often take the responsibility for car maintenance. If they have systematically been overlooking the greater safety of large cars, it would not be emprising that Title II information that makes it impossible to overlook this factor has the effect of moving some men toward large cars.

In other words, the hypothesis is that Title II's effect is to call attention to areas a consumer has not been paying attention to.

E. Demographic Characteristics and Choice of a Title II Version

It was reported earlier that, asked to make a direct choice among the four versions of the Title II ratings, most survey respondents chose 3B. Table 14 shows that this conclusion holds across the demographic groups examined: in none of the columns in the table was any other version preferred over 3B.

Table 14

## Percent Ranking First Each of the Title II Information Forms

	Total	Men	Women	Income			Age			Next Car Purchase		
				Under \$7,500	\$7,500- \$14,999	\$15,000 and Over	Under 30	30- 49	50 and Over	Small	Intermediate	Large
3A	28	29	28	30	27	28	29	24	34	20	27	31
3B	34	35	33	32	33	36	31	37	34	41	37	32
3C	17	18	16	15	18	20	23	17	11	23	15	14
3D	20	18	24	24	22	17	17	23	21	16	23	23

## VII. CHOICE OF A HEADLINE FOR TITLE II MESSAGES

Survey respondents were shown a list of six "headlines" for Title II information and were asked which would be best at making them interested in reading the information. The headlines and the percentages of respondents choosing them are shown in Table 15.

In an earlier research stage, consisting of group depth interviews, the third headline listed in the table was identified as most promising. The table, of course, puts it in second place, behind the second headline listed.

Advertising experts will testify that a "preference vote" by consumers is not an appropriate test for copy. Consumers do not necessarily know what will motivate them. Thus, Table 15 should not be used to override the earlier research, in which reactions to the headlines was probed in some detail.

It is interesting that:

- Of the two headlines that stand out in Table 15, one was the previously selected headline.
- The two headlines that stand out have in common a straightforward language style and the mention of all three Title II variables.



Table 15

## Percent Ranking First Each of the Headlines

	Income					Age					Next Car Purchase		
	Under \$7,500- \$15,000					Under 30- and 50							
	\$7,500 \$14,999 and over					30 49 over					Small Intermediate Large		
Total	Men	Women											
6	6	7	7	5	7	9	4	4	9	3	5		
29	29	28	28	28	31	29	30	26	32	29	28		
21	21	22	22	22	20	22	22	20	22	19	22		
10	11	10	10	11	11	10	11	10	9	14	8		
16	14	19	17	17	13	15	16	15	13	14	22		
18	20	14	15	18	18	14	17	23	14	22	14	100%	100%

### VIII. SPECIAL TOPICS IN THE GROUP DEPTH INTERVIEWS

A number of specific areas were investigated in the group depth interviews but not in the survey:

- In some cases, these were relatively minor points, not worthy of inclusion in the survey.
- In other cases, the issues were important, but so hedged around with qualifications and hypothetical considerations that the unstructured discussion format of the group depth interviews seemed the only feasible way of examining them.

#### A. The Time Gap in the Title II Ratings

In the group depth interviews, after participants had considered in detail the usefulness of the Title II ratings, it was pointed out that, because the ratings depend upon accumulated accident and maintenance records, they would always lag at least a year behind. That is, ratings for the 1975 models would not become available until the 1976 models were already on the market.

Most participants were neither surprised nor dismayed by this information. While they could only agree that current model year ratings would be more desirable, there was very little feeling that the time gap made the ratings unusable. Only a few participants, overall, were very disappointed at the time lag.

Many participants offered convincing explanations for their relative lack of concern:

"We usually buy used cars."

"Cars don't change that much from year to year."

"I guess I figure that cars don't change that much."

"That's the way Consumer Reports does it."

Thus, many participants were willing to assume that a model's performance in past years provided some useful guidance on the likely performance of the current year. Some of them pointed out that they were accustomed to making this kind of extension when they selected a new car from Consumer Reports' maintenance ratings, or when they selected a new household appliance, for example, from past experience of themselves or their friends with various brands.

We conclude that without denying the desirability of up-to-date ratings, a lag will not destroy the usefulness of the ratings for most people. It will for a minority, however.

#### B. Problems with the Maintenance Rating

The maintenance ratings, as they have taken shape, have a potentially serious flaw. These ratings combine estimated cost for preventive and corrective maintenance. Preventive maintenance costs were derived from the manufacturer's schedule, as published in the owner's manual, and raise two issues:

- If owners do not follow the manual, the Title II rating does not estimate their actual cost
- A manufacturer can manipulate his rating simply by changing his maintenance requirements as printed in the manual.

Attempts to explore these issues with the group depth interview participants were not very fruitful. Many participants almost "clung" to the meaningfulness of the dollar figures they had been shown, and resisted attempts to call that meaningfulness into question.

An alternate rating scale for maintenance was shown to the participants. This scale summarized the cost to perform certain maintenance items and repairs. Participants rejected it because it showed little range among makes, and also because it failed to take into account the frequency with which these repairs were necessary.

The conclusion is that consumers want a maintenance rating that reflects both preventive and corrective maintenance, and that takes into account both cost of repairs and frequency of repairs.

### C. Accident Damage Repair and Insurance

The group depth interview participants explained that accident damage repair cost ratings were of no interest in choosing a car because such costs are covered by insurance and their cost is always an invariable amount (the deductible from the insurance policy). It was then proposed to them that insurance companies might recognize the rating differences by basing premiums upon them. It was proposed that a favorably rated car might receive a fifteen or twenty dollar reduction in its premium.

Virtually no participants saw this as a significant benefit, worthy of attention when choosing a car. The almost universal feeling was that in the context of a derision involving thousands of dollars, twenty dollars a year is not a sufficient inducement to make even small compromises in the bases of car preference.

In conclusion, insurance premium adjustments of fifteen to twenty dollars a year are not sufficient to make accident damage repair costs useful to consumers.



#### D. Insufficient Data for Ratings

It was explained to the group depth interview participants that, since the Title II ratings depended upon the accumulation of records, some cars might not be rated.

Assessing the impact of this possibility is very difficult. The participants often seemed unsure what their response would be if a car they were interested in were omitted from the ratings. However, it does appear that at least some consumers, those who are most impressed with the Title II ratings, would restrict their purchase consideration to cars that are rated.

Furthermore, attempts to explain the omission as simply resulting from insufficient numbers of certain cars to accumulate records of certain cars sometimes backfired:

"That would make me wonder why they sold so few of those cars. Why don't people buy them? There must be a reason."

We conclude that while this issue is too complex to be susceptible to an easy answer, it appears likely that omission of cars from the ratings because of insufficient data will penalize those cars with some consumers while it benefits the cars with virtually no consumers.

#### E. Consumer Orientations toward Safety Ratings

During the group depth interviews an insight into consumer expectations about safety information was achieved. Many of the participants, told they were about to see safety ratings, assumed or took for granted that the ratings



would report or be based upon "the way the car is made". That is, they expected that the rating task involved an assessment of the strength of materials and construction, and/or the "number of safety features". Thus, some people were prepared for something other than a rating based on statistical analysis of actual accident outcomes.

With only a few exceptions, there were not serious objections to the safety rating actually used. The significance of the consumer expectation does not lie, therefore, in any tendency to reject the rating used, but rather in what is revealed about consumer thinking in this area.

Implicit in the orientation described is the assumption that car safety is a function of strength, stiffness, rigidity, and resistance to deformation.

The conclusion is that in the absence of information to the contrary, many consumers seem to take for granted that a car that is made of heavy, strong material so that it crushes or deforms little on impact will be safer.

#### F. Rating Dissemination Procedures

Group depth interview participants were queried on means for making the ratings available to them. Very commonly, it was reported that the ratings should be made available in automobile showrooms. In fact, many participants seemed to assume that would be the dissemination method and to expect it to be entirely adequate.

While some participants called for use of the mass media, print or broadcast, most could recognize difficulties when they were pointed out: the great detail of the information, and the inefficiency of providing it to people not currently in the market for a car.

On the other hand, many participants admitted they might not get around to writing for such information, even though it attracted them.

Some participants resolved the dissemination difficulties by proposing that the ratings be made available through a variety of sources:

- Auto showrooms
- Post offices, city halls, motor vehicle departments, and other "official" locations
- Included in mailings of state motor vehicle registration forms
- Included in mailings of automobile insurance premiums (it was assumed that insurance companies would have a vested interest in publishing these ratings).

In summary, consumers will expect to find the ratings in automobile showrooms. Distribution through a variety of "pick up points" and mailings would also seem appropriate to many people.

#### G. The Role of Government

In an earlier report covering a preliminary round of group depth interviews, it was concluded that a significant amount of objection to the government's involvement in automobile ratings existed. The objections were based upon resentment of government encroachment on private enterprise and/or beliefs that government programs do not work efficiently enough to do the job adequately.

In the round of the group depth interviews reported here, however, resistance to government involvement seemed much lower. In fact, from these results it would not be judged a problem worthy of much attention.

Several explanations for the difference in results are possible:

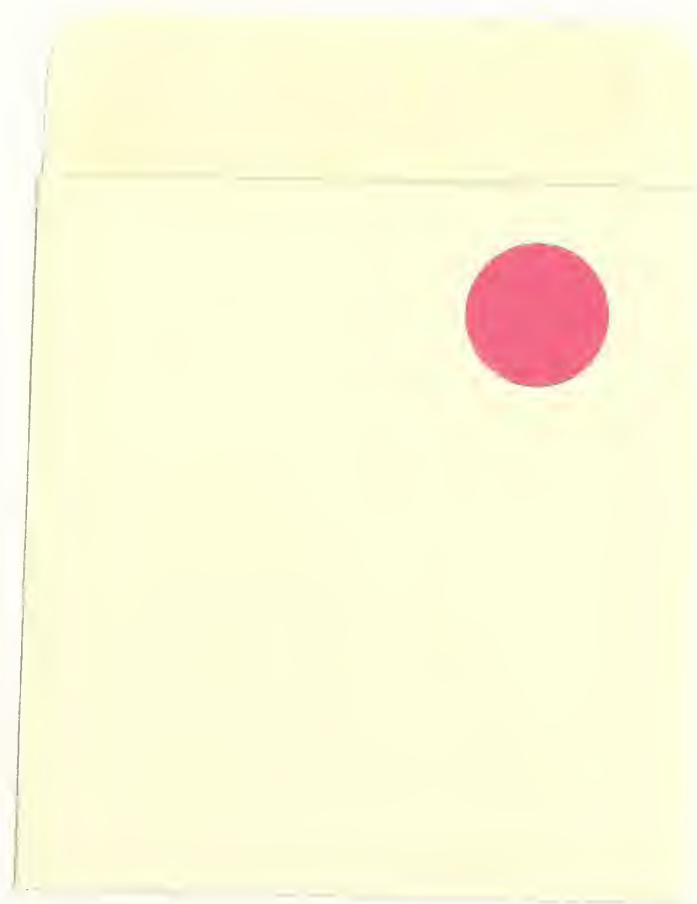
- Simple sampling error, given the small numbers of people involved.
- Differences in location. In the earlier group depth interviews much (but not all) of the government criticism came from Detroit, where there may be special motivations for resenting government involvement with the auto industry, and York, Pennsylvania, a small city that may be characterized by non-urban conservatism (although the current round of group depth interviews included Plant City, Florida and Waterloo, Iowa).
- A decreasing tendency to complain about the government with more time elapsed since the "Watergate scandals".

Whatever the explanation, when both sets of groups are now weighed it appears that the earlier report probably overstated the importance of resistance to government involvement.

However, one new source of concern emerged: the EPA gas mileage ratings have attracted a great deal of attention, and disbelief in their accuracy is very widespread. Many participants seem to regard the program as a fiasco at best, and a case of auto industry influence of government programs at worst. There is little appreciation of the point that the EPA ratings, while inflated, still reflect validly the relative differences among cars. Rather, the participants react to the knowledge that neither they nor anyone they know obtains the mileage claimed as indicating that the ratings are unreliable and untrustworthy.

A number of participants specifically related the EPA ratings to the Title II ratings, seeming to wonder if the EPA experience should not serve as a caution about expecting too much from Title II.

In conclusion, resistance to the idea of government involvement is not a significant problem. However, the EPA gas mileage ratings are seriously undermining government credibility.





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